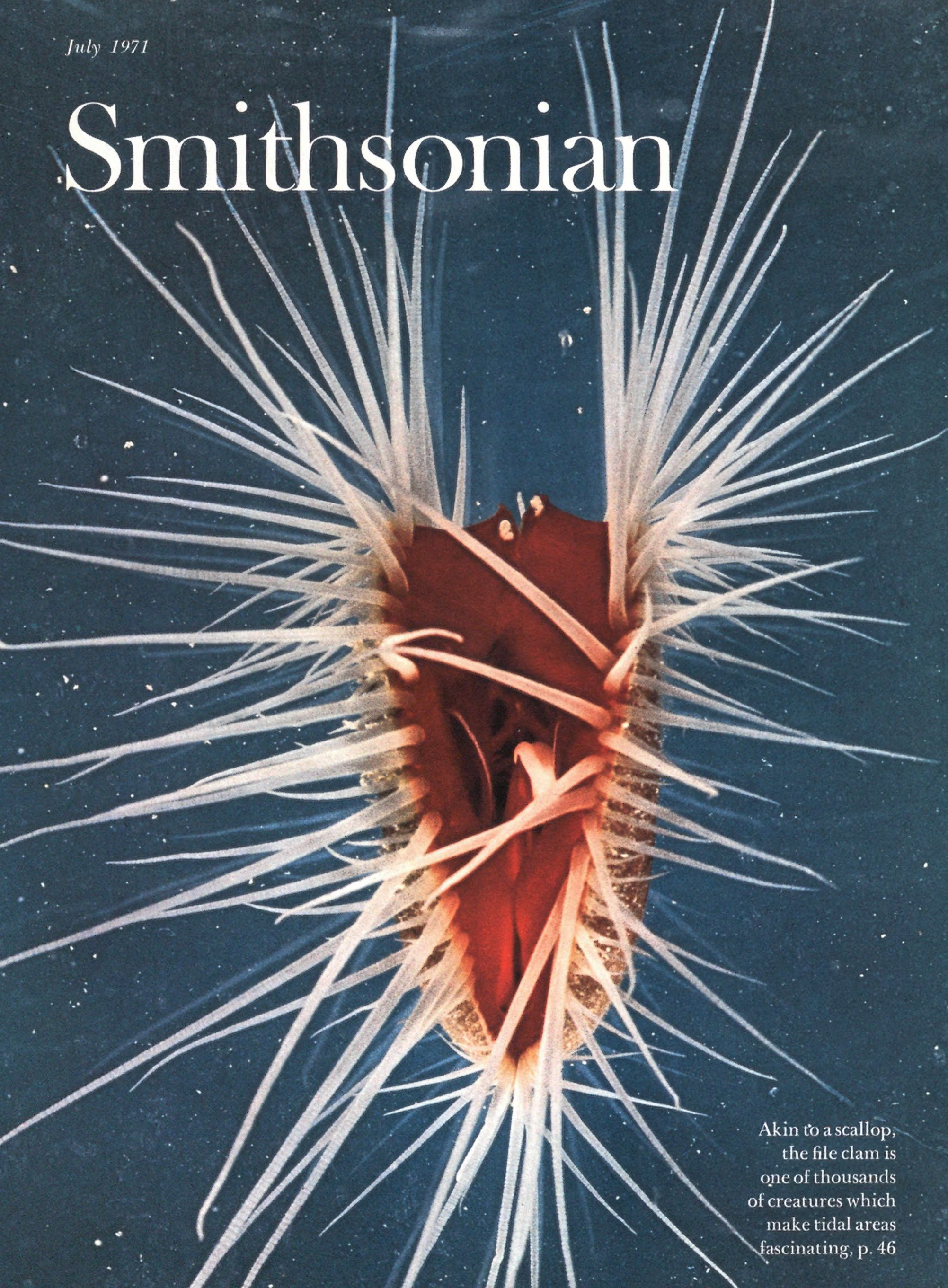
July 1971

Smithsonian



Akin to a scallop, the file clam is one of thousands of creatures which make tidal areas fascinating, p. 46

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The view from the castle

Ecology started as a dubious science.
Yet its growth, nourished by
world conditions, has been explosive

In my undergraduate days, ecology was thought of as an outdoorsy sort of exercise, akin to the yearnings expressed by hobbyists for more untrammeled nature. My fellow biologists might revere Aldo Leopold for his lyric writing and passionate devotion to the chronicling of the annual cycle in nature, but he was not a "lab man" who dealt in stern realities of controlled experiments, quantitative measurements or mathematically derived proofs. The attempts of nascent ecologists to measure salinity or study the migration of plankton seemed tenuous.

Of course, laboratories like Woods Hole were important to science. But partly it was fun to get out of the lab for a while in the summer. The sterner stuff was back in the lab.

The year 1950 marked the beginning of my interest in conservation. As an ornithologist working in biology, I had thought of conservationists as people who kept bird lists but did not care about bird science and in fact tended to be frightened of bird scientists (perhaps suspecting them to be crypto-vivisectionists) and who went to bird-club meetings once a year and railed at politicians and land despoilers.

I began to realize that at the rate at which human population was increasing, and exploiting the land, natural habitats would be so severely depleted by the turn of the century that much of the end products of evolution, the thousands of species of birds, the millions of species of other animals, each closely adapted to its own ecosystem, would cease to exist.

My first concern was for the genetic waste, the fact that these end products of adaptation would be snuffed out before we, as human observers, would *know* what it was that they in fact represented. Conservation thus meant to me the preservation of a mosaic of habitats in which could be preserved at least a broad cross section of species which would serve as a reservoir for accumulating a further storehouse of information.

I felt that it was imperative that biologists who knew the facts should somehow make themselves known to conservationists if only to advise them and keep them on the right track.

Meanwhile, the tangled skeins of pollution evolved from urban sprawl, industrialization and overpopulation, to name a few sources. From the sheltered confines of the laboratory or the museum, biologists—whether experimentalists or students of speciation—could look out on a situation for which ecological research had hardly prepared them. Ecology had suddenly become an urgent area for research, as urgent as biomedical research.

Now, our plundered country, our overstuffed and affluent people, saturated with drugs and residues of pollutants, are beginning to sense that population increase is slowing down ever so slightly, even as we develop polarized classes of people. We must begin to realize what the ecologists and the evolutionists have long sensed: The biosphere is all one; the realms of species are finite; the ecosystems interdigitate. The quality of life turns out not to be simply a romantic ideal, but a set of standards, still intangible, still highly arguable, on which to base survival.

S. Dillon Ripley

Letters to the Editor

Neanderthals

Dear Sir: Dr. Ralph Solecki's article on the Neanderthals in Iraq was most interesting, but I read with some surprise that "the classical hypothesis, now abandoned, was that Neanderthal man was an ancestral stage through which *Homo sapiens* passed." I had been under the distinct impression that "Neanderthal has been ridiculed and rejected for a century. . . ." Yet, I find that "despite this he is still our ancestor." Obviously, the title should have been "Neanderthal is not an ancestor but is an ancestor."
G. R. Strasenburgh jr.
Washington, D.C.
The latter use of the term, "ancestor," was meant in this context in the broad sense, just as various forms of even earlier anthropoids are our ancestors—though perhaps not in a direct *line.* Ed.

Dear Sir: Dr. Solecki's excellent article on Neanderthal was certainly enlightening. Being a physical anthropology teacher in high school, I am constantly trying to get my students to accept the fact that Neanderthal was not some extremely primitive ape-like brute who dragged his women around by their hair. This article does indeed make him seem closer to us in more ways than most people believe.
Ronald J. Merritt
Russell, Massachusetts

Wildflowers

Dear Sir: I was most interested in Charlton Ogburn's article on wildflowers but sorry that he did not mention trailing arbutus *(Epigaea).* It has a delicate fragrance and grows throughout the eastern North American states. Many people feel that it has the sweetest scent of any wildflower.
George R. Debnam jr.
Baltimore, Maryland

Dear Sir: This is our first year in the Blue Ridge Mountains, and I must tell you how delighted we were to read your article and view the excellent photographs of the wildflowers in your May issue. Just the day before your magazine arrived, our teen-aged son (who is unscholarly and never before was interested in wildflowers) began to collect a variety of them which in turn fascinated me. We pored over the photographs and descriptions in your article and learned that we have seven pictured there. This led us to further investigation and motivated the most pleasant research project we as a family have ventured upon. The pitfall of looking—without seeing—has been recognized at last and is most rewarding.
Mrs. Dan H. Dietrick jr.
Cascade, Maryland

Organic farming

Dear Sir: Wayne Barrett's article about organic gardening must read like science fiction to young people who have never heard of Bernarr Macfadden, or shoveled manure onto garden plots. Of course, there is some truth in the piece, but not enough to impress old-timers who, 50 years ago, helped our parents compete on even terms with insects and rodent pests for bare subsistence.
Alida Sverdsten
Cataldo, Idaho

Dear Sir: I am not a new breed of farmer —I am not longhaired, not city-bred, not under 30 (but 74), and I do not work an experimental plot. Yet, I believe in "The organic way of gardening and its prophet." The lusty vegetation in my half-acre lot proves the wisdom of the Rodale teachings.
John H. Meursinge
Yorba Linda, California

Dear Sir: Three cheers for the excellent article on Jerome Rodale. Oregon and Washington fruit growers have had to import honeybees from California to insure the success of their apple crops—this thanks to the indiscriminate use of insecticides in the Pacific Northwest. They would do well to follow Mr. Rodale's example.
Mrs. L. Eric Terrell III
Columbia, South Carolina

Dear Sir: I have read Mr. Rodale's magazines for several years and was appalled to read that he "eats hearty meals supplemented with a handful of synthetic vitamin tablets." I am sure Mr. Rodale takes only natural vitamin supplements, such as the bone-meal tablets mentioned elsewhere in the article.
David P. Taylor
Washington, D.C.
Mr. Taylor and others who have written are correct. Shortly before his death, Mr. Rodale said he used only natural vitamins such as rose hips (for vitamin C), wheat germ (for vitamin E) and fish-liver oil (for vitamin A). Ed.

Freeze-dry lab

Dear Sir: I would like to express my abhorrence at the picture included in the article, "A taxidermist's frozen menagerie." I found the picture showing the vacuum tank door "adorned with a chimp's arm" very difficult to explain to my young boys who eagerly await the arrival of your magazine each month. If I wish to view animal trophy rooms, I would subscribe to the various periodicals suited to the huntsman.

Until the May issue, I had nothing but praise for your fine efforts, and I'm sorry that I feel moved to write this criticism.
Mrs. Anita M. Fitzgerald
Kent, Ohio

Dear Sir: I am a fifth-grader and I want to know why you have to kill animals and freeze-dry them for exhibits. We have many zoos for animals, and people can go there to see them. It's more exciting when they are alive to watch them do things, but when you freeze-dry them that is really terrible.
Denise Buckey
Wayne, New Jersey
Dr. Rolland Hower points out that the principal sources for the animals used in the freeze-dry lab are those killed in highway accidents and zoo fatalities. Birds flying into the Washington Monument and other towers, picture windows and tall buildings are another source. Ed.

SMITHSONIAN *index*

Dear Sir: We are experiencing difficulty because you included the index of Volume 1 of SMITHSONIAN in an issue of the following volume. We keep our periodicals in bound volumes; this involves sending the completed volume to our bindery along with the index to that volume. For Volume 1, utilizing the index means defacing an issue of Volume 2.

In the future, might you consider publishing the index separately?

Mrs. Margaret B. Zorack
Librarian, The Brooklyn Museum
Brooklyn, New York

In answer to your last question, yes. But the Volume 1 index may be snipped out of our May issue without defacing it. Ed.

Dear Sir: I notice that the titles of articles given on their first pages do not agree with the titles given in the table of contents. Which of these are the "official" titles?

Michael N. Tierstein
Brooklyn, New York

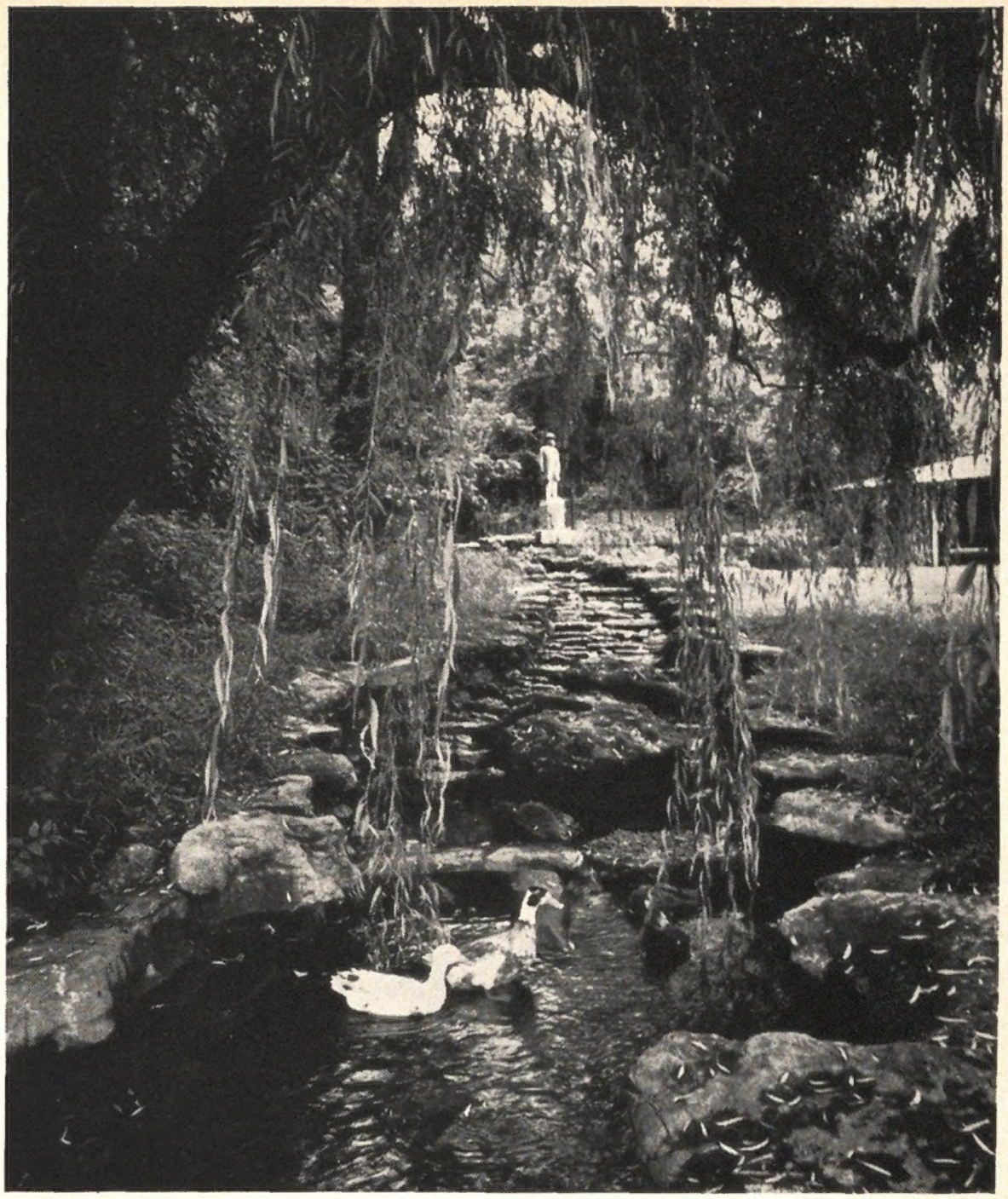
In making up the index and table of contents, we arbitrarily selected titles which would be most informative to the reader. A top headline on an article may have to be considered along with a subheadline and thus we felt might be somewhat cryptic used alone. Ed.

Plundered art

Dear Sir: Your informative article, "The Maya Scandal: how thieves strip sites of past cultures," by Clemency Coggins in your October 1970 issue, may have had its part in the latest U.S. step to stop the importation of stolen archaeological treasures. The State Department recently sent a draft bill to Congress which, if passed, would prevent the importation of "pre-Columbian monumental and archaeological sculpture, murals and any fragments or parts thereof" unless accompanied by a certificate from the country of origin certifying that their export did not violate its laws.

Although this proposed legislation covers only pre-Columbian art, I hope that further action will be taken to stop the outrageous plundering of art in other areas of the world such as the Near East and the Mediterranean.

Dimitri Petropoulos
New York City



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During the transition period from the beginning of April to the present, while our records and files were being transferred and converted to the new system, it was not possible to make many adjustments or corrections. We are now catching up.

If you wrote about a subscription problem prior to the end of March and it has not been straightened out yet, please write the particulars to the address below so that we may correct it.

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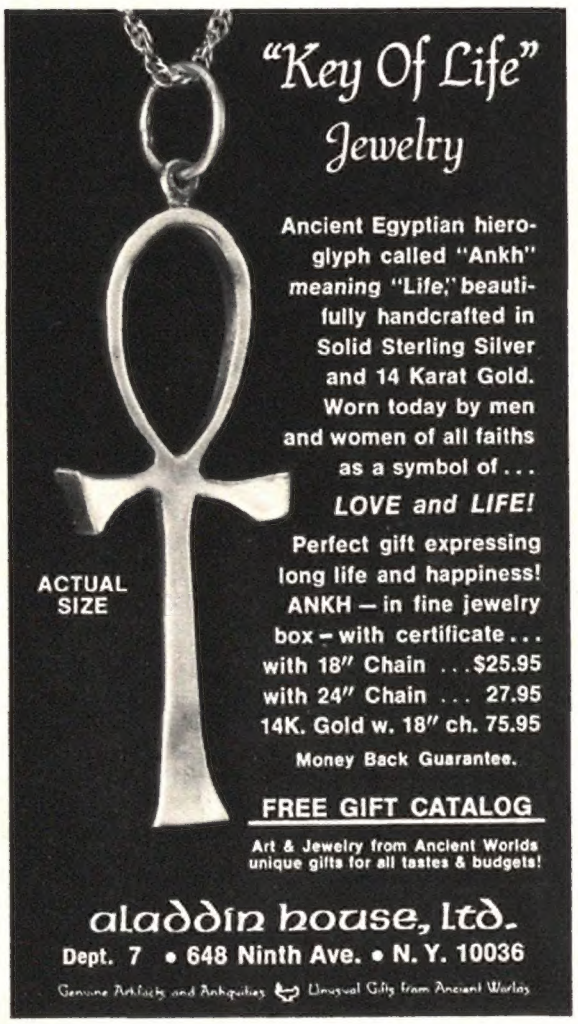
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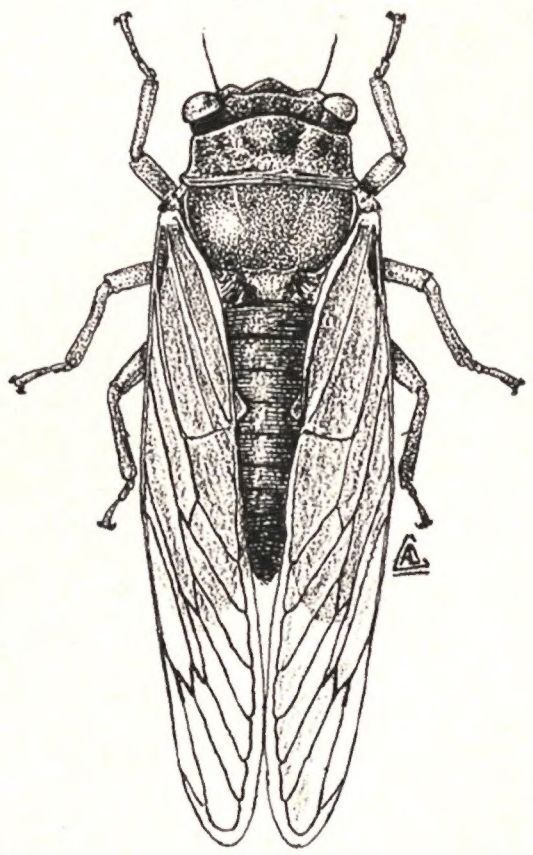
Continued from page 3

Cicadas

Dear Sir: Karl and Dorothy Krombein's article on cicadas in your May issue was particularly interesting because of a childhood memory that has often provoked my curiosity. I climbed apple trees in our orchard in Delaware and found what we called "locust shells" all over the trees. I haven't seen one in years, and I had wondered whether there were as many as my memory indicated. Now, I have the answer.
Mrs. J. Edward Phillips
Sun Prairie, Wisconsin

Dear Sir: "From nymph to noise . . ." sounded a familiar note to someone raised in the Salt River Valley of Arizona. Your map stopped short of the cicada's full range. I recall two successive emergences in the late Forties of distinctively different species. One appeared similar to those pictured except for white edging about the thorax. The second was

Magicicada



Even side by side, the two genera of cicada are very similar. (2½ X life)

Dr. Richard Froeschner of the Smithsonian Entomology Department says the cicadas seen in Montana and Arizona are not Magicicada—*the periodical cicada discussed in our article—but are of the genus* Okanagana, *a fairly common ci-*

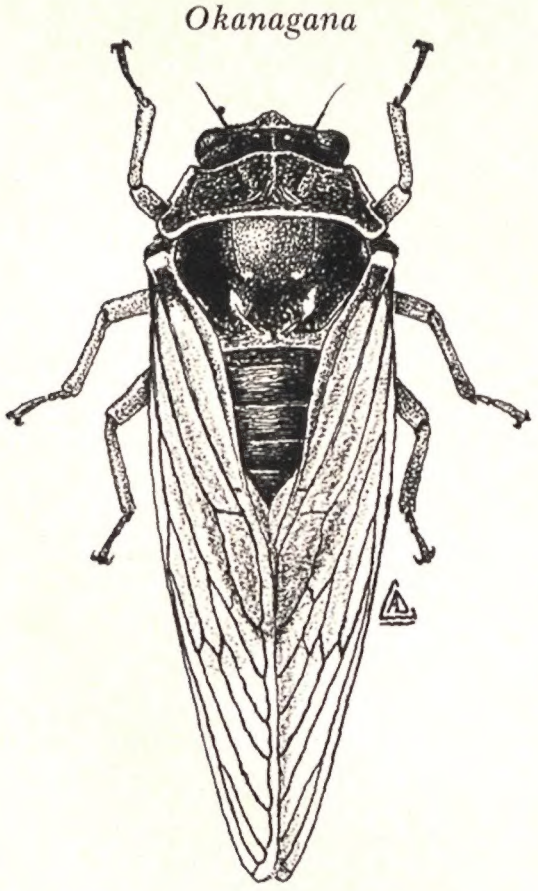
smaller and had a distinct gray cast with white chevrons on the sides of the abdomen. There were other emergences but not on successive years. I would surmise that there are colonies of both 13- and 17-year cicadas active in Arizona and nearby states.

R. B. Wister
San Jose, California

Dear Sir: The Krombeins' article states that "the periodical cicada is a natural phenomenon unique to the eastern United States," but I'm sure this isn't correct. We have the periodical cicadas here in Montana and, though the big influx seems to follow the 17-year cycle, we have had smaller broods in other years. These are true cicadas, looking exactly as those pictured in your magazine. Furthermore, no one could mistake that noise! They are easy to catch and, the next time they emerge, I will send you some to prove the point.

Harry J. Owens
Red Lodge, Montana

Okanagana



The primary distinction is the thorax—broader behind the eyes of *Okanagana*.

cada of the western half of the United States. So far all of the specimens sent to the Smithsonian from the West have proved to be Okanagana, *not* Magicicada, *but the Entomology Department welcomes specimens.* Ed.

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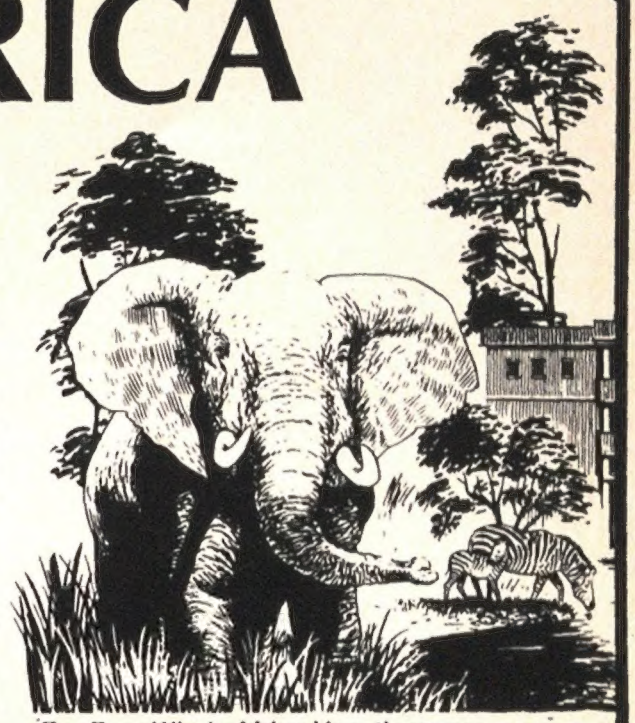

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By Daniel Jack Chasan

The Seattle area wouldn't allow death of its lake

Alarmed citizens, backed by hard science, took up the politics of anti-pollution and succeeded in saving Lake Washington

Under a microscope it looks innocuously like the top view of a train as drawn by a child, or perhaps by an admirer of Paul Klee—it's a long string of box-like cells laid end to end, each cell filled sparsely with squiggles. But the appearance of the alga *Oscillatoria rubescens* in a freshwater lake is greeted rather like the appearance of dead rats in a populous city.

Just as the rats often signal a coming outbreak of plague, *Oscillatoria* often signals the serious deterioration of the lake by eutrophication. Not that year or perhaps the next, but soon, algae of many different kinds will begin building up at the surface of the lake. Alive, they'll make boat hulls and beach rocks slimy. Dead, they'll perfume the lakefront with their stench. And as they build up, more and more of the free oxygen in the deep water will be exhausted by the decomposition of dead algae, forcing deepwater fish first toward the surface, where the temperature is too high for them, and then out of the lake.

Oscillatoria's role as a forerunner of this process was documented in a whole succession of Swiss lakes in the 19th century. Most lakes in the East and Midwest of this country (Lake Erie, SMITHSONIAN, December 1970), though, differ significantly from Alpine lakes in ways that are both known and unknown—harder water is one of the known ways—and although *Oscillatoria* has been seen here and in Canada, it has been relatively rare.

But in the West, at least one large American lake is very similar to Swiss lakes: 20-mile-long, 240-foot-deep Lake Washington, which divides Seattle from its eastern suburbs. Houses and parks line much of the lakeshore. On clear days, the water is still and blue and covered with sailboats, speedboats, yachts, rowboats, occasional tugboats and canoes.

One summer day in 1955, while a young University of Washington ecologist named George Anderson was out on the lake in a sailboat, he decided the water looked *different.* He collected a sample of the water in an old beer bottle, took it to his lab and looked at it under a microscope. What he saw was *Oscillatoria rubescens.* At least, he thought it was. He took the sample for verification to W. T. Edmondson, a limnologist who had taught at the University since 1949 and had supervised Anderson's Ph.D. work. As a limnologist, Edmondson specializes in the study of lakes, and he is a recognized authority on Lake Washington. He thought Anderson's sample

From an island in Puget Sound, Daniel Jack Chasan has written for The New Yorker *and a book,* Klondike '70, *on the oil boom in the Alaskan tundra.*

was *Oscillatoria,* too, but he wanted to make sure. *Oscillatoria* is brownish purple, but it is classified as one of the "blue-green algae." Francis Drouet, then at the Field Museum of Natural History in Chicago, probably knows more about the blue-green algae than anyone else in the United States. Drouet thought the sample was *Oscillatoria,* too.

Edmondson and everyone else who studied or lived near the lake already knew that the population of algae had started to increase. Until the 1930s, Seattle had dumped some raw sewage into Lake Washington, but when the raw sewage created a health hazard it was diverted into Puget Sound, and for a few years the lake was relatively sewage free. But Seattle grew and so did the communities along the lake's eastern shore. By 1941, ten plants were dumping treated sewage into the lake.

Treatment speeds up the decomposition of sewage, taking it past the point at which it harbors bacteria harmful to humans but not destroying the nutrients the sewage contains. In fact these nutrients, chiefly phosphates and nitrates, are made more readily avail-

Filled with algae, water lapped a nearly deserted Lake Washington beach in 1964 (above). But within four years the problem was virtually solved and today (below) the lake's waters are filled with children.

able to algae, which absorb them. As the population around Lake Washington mushroomed, so did the quantity of sewage being pumped into the lake. By 1955, 20 million gallons a day were pouring in to feed the algae. And the algae prospered accordingly. Starting in 1949, Edmondson's students, Anderson and G. W. Comita and others, had documented a steady increase in their numbers. But to Edmondson, the appearance of *Oscillatoria rubescens* meant that the lake was probably further gone than he or anyone else had realized.

If he had been the only person already concerned about Lake Washington, all he would have had to show for his concern would probably have been a well-documented case history of eutrophication. But there was a core of politically knowledgeable and energetic people who were also concerned, were already working on the problem, and were prepared and eager to put Edmondson's findings to use.

The core of the core was a young Seattle attorney named James Ellis. When Ellis began practicing law in 1949, his first clients included some of the small sewer districts around Lake Washington. He could see that no single district had the resources to handle its own increasing load efficiently, and that voluntary cooperation among the districts was unlikely, because some local politicians and engineers clung firmly to their spheres of authority and had no desire to merge with or make concessions to their neighbors. He also knew of early scientific studies.

One of Ellis' clients, the Bellevue sewer district, had begun thinking about building yet another big treatment plant beside the lake. Ellis suggested that another treatment plant might not be a good idea. So the Bellevue engineers came up with the idea of building a sewer line from their own district, which is in the center of the eastern shore, around the south end of the lake and out into Puget Sound. Bellevue would have needed the cooperation of several neighboring districts, though, and that cooperation wasn't forthcoming. Ellis stored away the idea.

In 1953, in a speech to the civic-minded Seattle-King County Municipal League, Ellis suggested a system of metropolitan organization that would bring Seattle and the nearby communities together to work on problems that were too large for any one community to solve individually, but leave them politically autonomous. Three years later, a new mayor of Seattle, Gordon Clinton, formed a Metropolitan Problems Advisory Committee to study regional problems, and he named Ellis as its chairman.

Sewage was one of the committee's main concerns, not only because of the obvious deterioration of Lake Washington, but also because Seattle and adjacent communities were dumping great quantities of totally raw sewage into Puget Sound, which was foul for miles up and down the shore.

The most promising solution to the sewage problem seemed to be building a huge pipe around the lake, picking up sewage from all the lakeside communities and intercepting the raw sewage bound for Puget Sound, then running it all through huge treatment plants and out into the sound.

Unlike most lakes, Puget Sound can probably accommodate a huge amount of treated sewage without getting choked by algae, according to George Anderson. In addition to being more than 100 miles long and 900 feet deep, the sound has its water replaced frequently; also, it allows algae to build up in shal-

A familiar sight on Lake Washington's shores in 1958: Of what earthly value is water you can't swim in?

Seattle attorney James Ellis, at his home on the lake, masterminded the drive to clean it up.

Ellis relied heavily on zoologist W. T. Edmondson (seated) who had analyzed the lake's decline.

low water along the shore for a couple of weeks, then sweeps them out with the tide into deeper water and shuffles them vertically through all 900 feet, depriving them of light and stopping their growth. Some people, including officials of the federal Environmental Protection Agency, have speculated that sewage sediment and algae might build up in sheltered bays and inlets in the sound, but so far there's no evidence that the possibility of such buildups is anything but theoretical.

To build a sewer line around the lake, it would be necessary to set up a metropolitan organization that would have jurisdiction over the entire area and to add roughly two dollars a month to the sewage bill of every household to be served.

First, Ellis and his colleagues wrote and helped fight through the 1957 session of the state legislature a bill that put the proposition up to a vote of the people in the area. (The bill's floor manager in the House was Dan Evans, then a first-term representative but now governor of the state.) Next, they had to sell the idea to the Seattle-area voters. Their proposition for Municipality of Metropolitan Seattle, or "Metro," as it has always been called, included authority to handle not only sewage, but also the regional problems of transportation and urban planning.

To get their package through, they had to overcome the aggressive parochialism of some local officials, an amorphous aversion to "big government," and also an aversion to paying what was then and is still on a per capita basis by far the highest long-term commitment for a service charge for clean water in a metropolitan area. In March 1958, Metro won a majority of 101,947 to 85,590 votes, but lost under a complicated system of weighting votes. "Metro has failed this time," said the *Seattle Post-Intelligencer,* "simply because too many people outside Seattle were convinced that Metro was a plot to saddle them with the expenses of Seattle."

Interested politicians and citizens' groups got the idea going again, however, and after dropping transportation and planning—and a particularly recalcitrant southern municipality—from their plans, Metro's supporters tried again in the September primaries. They lost a little ground in Seattle but gained a lot in the outlying regions and this time Metro passed.

Ground was broken on July 20, 1961. And the citizens who used Lake Washington soon had reason to congratulate themselves on their foresight. The next summer, a *Post-Intelligencer* headline read,

Floating bridges over Lake Washington link suburbs (foreground) to Seattle. In background is Puget Sound.

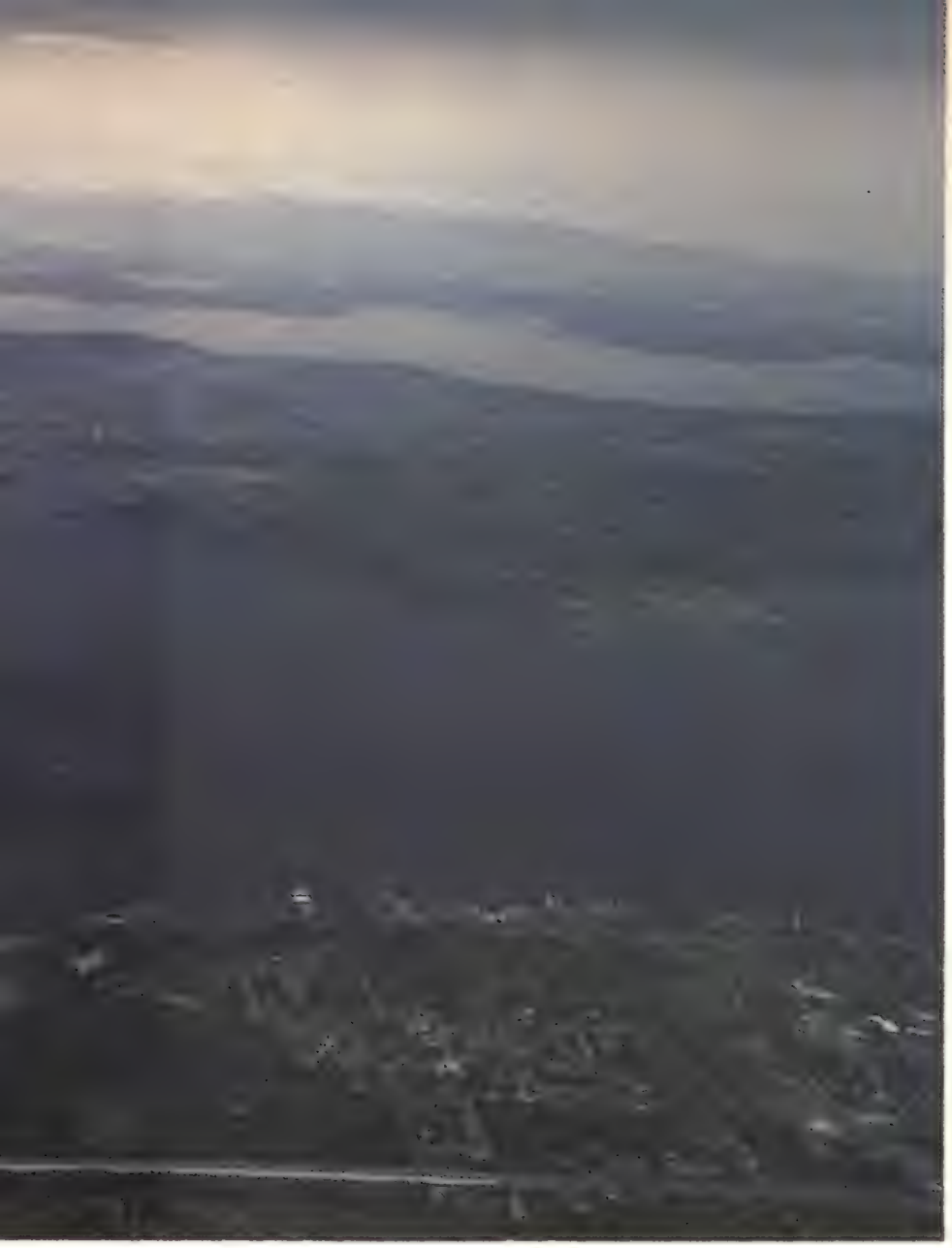
"Lake Washington Brown—That's Algae, Not Mud." An eight-inch white disc, which had been visible at least 12 feet below the lake's surface in 1950, was visible at only three. By 1966, visibility had sunk to two-and-a-half feet. But in 1963, the first of the growing flow of sewage had been diverted around the lake and, by February 1968, it was all being pumped through the new West Point treatment station on Puget Sound or Renton station on the Duwamish River which empties into the sound.

The Renton station is a "secondary" treatment plant, designed to remove 95.5 percent of the suspended solids from raw sewage. The West Point station, the largest in the Northwest, is a "primary" treatment plant designed to remove only 65 percent but it has been removing 76 percent in summer. Metro, the Washington State Department of Ecology and the Environmental Protection Agency have all talked about installing a "secondary" plant at West Point around 1985, but there are no firm plans for doing so, and since the federal funds now available for building treatment plants may not be available much longer, the Seattle area might find the building of a secondary plant prohibitively expensive.

Oscillatoria rubescens never did completely disappear, but the population of all algae began to decline. Visibility of the white disc increased to nine feet in 1968, and it has now returned to 12. Beaches that had been closed because of pollution in the late 1950s have now been open for years. In 1966, at the dedication of the West Point plant, Ellis said, "Ten years ago, the urban drainage basins of the nation were heavily polluted. Today, most of these waters have gone from bad to worse—but not here. Today, most of the nation's press are looking for scapegoats—but not here. Today, most local councils are still waiting for someone else to do it—but not here. Here we dedicate substantial completion of the largest single pollution-abatement project ever undertaken."

Metro's success is all the more remarkable, says Ellis, if you remember that the project started in the mid-1950s, and that "it was a very different climate then. The powerful conscience-builders"—by which he means largely the press—"hadn't been at work" getting people worried about pollution. Still, Ellis says, Metro started with some advantages.

For one thing, Seattle was an area where people really used the water, so the lake was important to them. Also, many people could remember when virtually all the lakes and streams in the Northwest were perfectly clear and, unlike residents of the East and Midwest, they hadn't grown up accepting foul water as an inevitable part of their surroundings. And there were a lot of people willing to work hard to sell the idea of Metro to their communities. (Ellis feels it's terribly unjust that most of these people, both politicians and private citizens, have been and will be ignored by history, while he and a few other conspicuous figures have gotten and will get all the credit.) And there was Dr. Edmondson with his stock of hard scientific data about the lake.



Huge sewer pipe at Renton: Part of 110-mile trunk line tying metropolitan region to Puget Sound.

Edmondson was "a powerful weapon," Ellis recalls. "We couldn't have done it without him." The two men made contact at the end of 1956 and, from then on, although Edmondson took no part in the political work of the Metro campaign, Ellis and his colleagues put him to good use.

"He was our data bank," Ellis recalls. "We needed emotional appeal, but we already had that. It's easy to make people feel guilty if they vote against a pollution measure. You can talk to them about fouling their own nest. It's easy to dramatize."

But even if pollution is the issue, Ellis explains, "It's easy to sow a seed of doubt. And whenever you go before the public in a referendum, the critics have a leverage of at least ten to one. A critic can say one sentence like, 'Is this Seattle or Moscow?' and it takes you 15 minutes to figure out what it means to everyone in the audience and 15 minutes to respond. Edmondson gave us the facts we needed to answer our critics. He provided the authority to back up what we were saying."

Also, Ellis explains, Edmondson "strengthened our faith in what we were doing. We wanted him to say what he did. We were looking for someone to say it. But when he *did* say it, he made us feel that the Lord God was standing right behind us on this one."

What Edmondson did was simply make public statements, appear on television, answer phone calls and generally make himself available to supply facts and predictions about the lake. "I thought someone should be supplying objective facts," Edmondson remembers, and he was careful not to play a partisan role. Still, because Ellis' side was quoting his data, Edmondson inevitably became a target, if not a participant, in the political fight.

An opponent of Metro said on television that since Edmondson was a zoologist and zoology was the study of animals in zoos, Edmondson couldn't possibly know anything about the lake. And so it went.

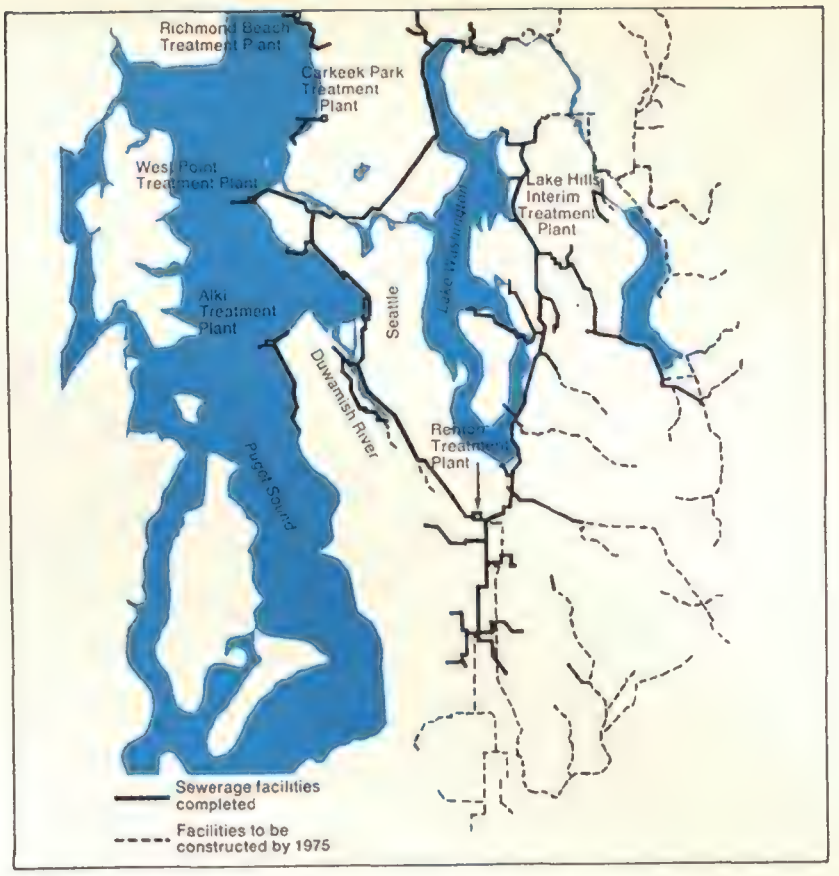
Both Edmondson and Ellis are delighted by the rapid recovery of the lake. Edmondson believes the experience proves that any lake that has some means of replacing its water supply with good quality water can recover quickly from eutrophication, that if a community tries to eliminate pollution, it won't have to wait 20 years to see results. Although he concedes that a lake that was essentially a big mud puddle without inlets or outlets, or a lake that had become

more heavily polluted, might not have responded so well, he argues that Lake Washington shouldn't be considered an isolated case.

"Look at all the *good* lakes, like Lake Washington, that have gone bad but could be saved," Edmondson says. When pressed for examples, he starts with Lake Zurich, then goes through Lake Sebasticook in Maine and Lake Winnisquam in New Hampshire to lakes Erie and Ontario. He thinks Lake Washington's recovery indicates that all those lakes *could* be promptly and significantly improved—and in fact *can* by doing the right things.

From a strictly scientific point of view, Edmondson is also pleased to have had the opportunity through a series of grants from the National Science Foundation to study the complete cycle of degeneration and recovery. The cycle has never been studied before in such a large body of water in such detail. And in the past few years, Edmondson has been able to observe that although nitrate levels have remained high, the levels of phosphates and algae have declined at nearly identical rates, indicating that phosphates are a central ingredient in eutrophication.

Edmondson suggests the possibility that if the phosphates alone had been removed, the lake might have recovered almost as quickly. The same results might have been obtained from laboratory studies, Edmondson says, but since a real lake has so many conditions, such as the presence of predators, that can't be duplicated in a lab, laboratory studies are insufficient by themselves and the opportunity to study Lake Washington was invaluable.



Master plan: 29 agencies route waste around lake through various treatment plants to the sound.

Ellis, too, thinks the lake's recovery shows what *can* be done if people are willing to try. In fact, he hopes it will serve as a model for other cities all over the country and the world. "One good model is worth 500 books," he says. "We need models."

In that context, though, it seems only reasonable to note that while the people who saved Lake Washington were impressively successful and far ahead of their time, they were also very fortunate in having virtually no vested commercial interests to overcome and in having Puget Sound which so far apparently has the capacity to handle the added nutrients. And indeed, although Ellis points out that many kinds of industrial wastes can be run through regular sewer systems, and that many cities have access to fast-flowing water where algae won't collect, he realizes that not everyone views the lake's recovery quite as he does. He tells the story that at a recent meeting of the National Municipal League, he said that the experience in Seattle proves it can be done. Someone else said, "No, it proves it can't be done. With thousands of cities in the country, Seattle is the only one, or if you count San Diego"—which you should—"one of the only two in the past 15 years where this has happened. Seattle is the exception that proves the rule."

Good water: Treatment plant at Renton removes more than 95 percent of suspended solids from raw sewage.

Good duty: Almost every summer day, scientists sample and test the lake's improving waters.

UW

Article and photographs
by Crawford H. Greenewalt

The hard-to-get hummingbird

Shown life-size in the most ancient game of all, an aloof female tries the tenacity of a male and poses problems for the photographer too

When the sap begins to run in the spring, most warm-blooded animals take fresh notice of the opposite sex, with a view to courtship, home building and the joys and privileges of matrimony. Birds are conformists, but their courting techniques vary widely from the spectacular to the completely humdrum.

Some birds, bowerbirds and manakins, for example, build highly decorated courting grounds in which the male calls and displays to attract a favorably disposed female. Others, such as the birds of paradise (SMITHSONIAN, July 1970) rely on their spectacular plumage and the exaggerated display postures it permits.

Some birds sing what is called their advertising song, which to our ears may be beautiful—the wood thrush, for example—or discordant, such as crows, jays and nuthatches. But what we think matters very little, since the female crow and wood thrush are equally excited by their potential mates' repertoire.

As one might expect, hummingbird males rely primarily on aerial acrobatics to enchant their ladies. In the course of many years of watching and photographing hummingbirds, I have been fortunate enough to see several of these performances. The eastern ruby-throat, a common hummingbird of the United States, flies with great rapidity through a large arc. At its

Chairman of the Board of du Pont and a Smithsonian regent, Mr. Greenewalt is author of the widely acclaimed book, Hummingbirds. *His story on the bird of paradise appeared in* SMITHSONIAN *last July.*

base the female is perched so as to get a view of the male dashing by, and he flies by facing her at his maximum speed. The technique varies from species to species and is not always a graceful performance.

Dr. Augusto Ruschi, my old friend and director of the Museu Mello-Leitão in Brazil, has described the courtship of *Phaethornis ruber,* a South American species: The male flies in circles very near the female, above and around her, chirping low as she watches him, turning her head to follow his movements. He approaches more closely and opening his bill sticks out his tongue and lets it drop in an exquisite and ridiculous manner . . . until the female at last gives signs of potential surrender."

One of my more painful frustrations is that I have never been able to photograph hummingbirds in their nuptial flight. Because of the extreme rapidity of their action and the large area involved, photography becomes virtually impossible.

The best I can do is to present the *preliminaries* to final courtship, which I do here for a male and female *Lophornis magnifica,* fairly common visitors to the feeding station operated by Dr. Ruschi at his house.

I apologize for using scientific names but there are no local common names. The English nickname for birds of the genus *Lophornis* is "coquette," which seems irrelevant when one considers the pugnacity of the males and their insistence on what might be called the direct approach. If an English name is really necessary, I prefer a literal translation and, since "lophos" in Greek means crest and "ornis" means bird, we could say the "magnificent crested bird," surely a phrase with a more Shakespearean ring.

The two birds, captured in October during the Brazilian spring, were placed in my photographic cage. Lights and camera were adjusted, and I waited more or less patiently. My guests settled down quickly but showed no immediate disposition to lovemaking.

A promise of consummation

Indeed, as the pictures at the upper and middle left indicate, indifference rather than eagerness seemed to characterize their attitude. Finally, however, there were signs of action; surely no one can doubt the male's interest at the lower left and upper right. Unhappily, there was no real response from the female whose attitude seemed to reflect fear and distress (particularly in the photograph at middle right) rather than the coyness and affection for which I had hoped.

In the end night came, with no nuptial flight, and the pair settled down in repose. The final picture shows them in peaceful slumber, and their closeness gave hope that on the next day, or soon at the very worst, the marriage would be consummated.

By Mary Sayre Haverstock

The National Collection reveals some long-hidden surprises

There are many more treasures in this Smithsonian museum than meet the eye—but a new show brings some of them into view

Every few months, it seems, the typical American museum is expected to serve up a big, new, lavish special exhibition. Works of art are shipped in from all over the country, even from abroad. While registrars and workmen wrestle with the arriving crates, curators toil long and hard over a handsome catalog. The public relations department tries to blitz the press, the critics come early and often, and the general public gets all dressed up for the opening and fights its way through the crush from Entrance to Exit.

It's an estimable custom, undeniably educational, and very convenient for the visitor because there is almost always a Theme. When he reaches the finish line, he can say with confidence that he has "done" Andrew Wyeth, or the Cabinetmakers of Philadelphia, or the Age of Funk.

But the Smithsonian's National Collection of Fine Arts is no typical American museum. Having mounted any number of successful Theme shows in the past, for this summer's major exhibition it decided to fling Themes, Retrospectives or Whatever out the window.

Instead, its Curator of Exhibitions and Design, Harry Lowe, dug into the museum's own reserves and came up with a brilliant array of things he feels the public should have a chance to see. The result is a lively, eye-opening exhibition aptly called "Hidden Aspects of the National Collection of Fine Arts."

Once upon a time the NCFA displayed Egyptian mummy cases, Chinese jade, English enamels, Russian icons, Renaissance furniture and Byzantine ivories in addition to, and mixed in with, its budding collection of American painting. But it has long since shed that omnium-gatherum image and now devotes its considerable energies to building up the American collections. "Hidden Aspects" is, therefore, in one sense a reminder of the NCFA as it must have looked in the days when it was tucked away in the Museum of Natural History, before it acquired its new home.

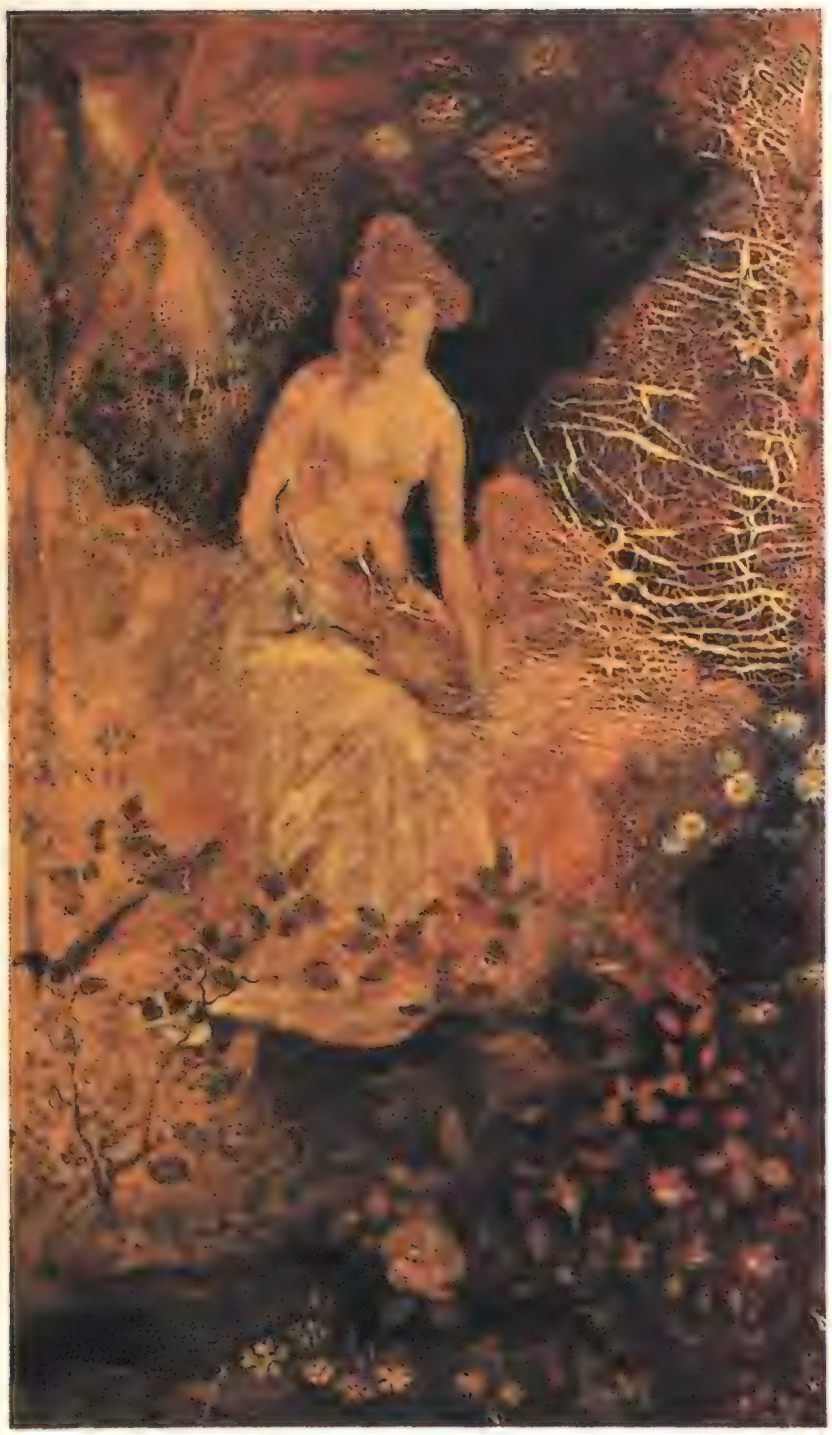
Many of the objects in this show might have stayed in storage until Judgment Day if their exposure depended on finding a theme to fit them into. For instance, to what category would one assign an anonymous three-dimensional rendition of St. George and the dragon (page 20) constructed entirely of glass?

Behind the grille lies part of the NCFA's storage space, which yielded up the paintings and objects in this summer's "Hidden Aspects" show.

Mrs. Haverstock is a free-lance writer who lives near Washington and described the Archives of American Art in the June issue of SMITHSONIAN.

On the Dunes (Lady Shannon and Kitty), 72 x 54¼″
A painting redolent of turn-of-the-century
taste by the U.S.-born artist James S. Shannon.

Surprise treasures



An unusual work by Albert Pinkham Ryder, although not in the best condition: one of three panels for a screen, painted on gilded leather about 1876.

Or a painting of a copperhead snake by Abbott H. Thayer demonstrating its protective coloration? Or domestic objects of Battersea enamel, the English ware so avidly collected by the late Queen Mary? The NCFA is not waiting for the off chance that there may someday be shows on such themes as "Lives of the Saints in 18th-Century Handblown Glass," "Nature's Camouflage Artists" or "The Taste of Queens."

Visitors won't come away from this show feeling that they have "done" any particular artist or epoch. All they will know for sure is that they have had a rare glimpse into the incredible scope and variety of a great museum's holdings.

And it will be well worth their while, because after the show closes on October 3 many of the objects will be returned to the dimly lit limbo where they are stored. Some, like Albert Pinkham Ryder's gilded leather screens (at left) were thought to be too fragile for exposure to the public's urge to touch as well as to admire. Others, such as the trove of precious Renaissance jewelry acquired from the collector John Gellatly in 1929, have not been shown for lack of proper facilities. Still others are waiting for the opening of additional exhibit space. And some items must await the day when taste comes the full circle and they are once again in fashion. In this group are such neglected turn-of-the-century American painters as Abbott H. Thayer, William Merritt Chase and Thomas W. Dewing, all well represented in the exhibition.

Watercolors, miniatures and rediscoveries

On the other hand, some have never been on view in Washington because they are too popular elsewhere. Childe Hassam's glowing watercolors (opposite) have been almost continuously on loan. Then there is the NCFA's little-known collection of miniatures, which—despite its size and importance—is almost never shown. There is needlework, of all things, by sculptor William Zorach and his wife. And some exciting rediscoveries from the WPA era which have miraculously survived three decades of public apathy in scattered corners and corridors of the federal bureaucracy.

The great beauty of a no-theme show, though, is the room it leaves for the completely unexpected, the unheard-of. Even measured against all the other extraordinary items in the show, one entry stands all by itself. It has to be seen to be believed, for it defies both verbal and photographic description: the *Throne of the Third Heaven of the Nations' Millennium General Assembly* (pages 22-23).

With such "hidden aspects," actually hidden *assets*, what museum needs to look beyond its own walls? Luckily for this summer's Washington visitors, not the National Collection of Fine Arts.

Childe Hassam, *The Island Garden,* 1892. A summery watercolor by an American painter who studied in France and was influenced by the Impressionists.

Miniature of an eye, artist unknown. The NCFA has several of these 18th-century conceits, probably worn as tokens of secret love affairs.

An *étui* of English Staffordshire enamel, c. 1780. Part of a large collection of such objects, this one is fitted with gilt sewing implements.

Right: 18th-century Italian relief of St. George and the dragon (17 x 11″), constructed entirely of blown glass with remarkable skill.

A medallion of St. Michael, made for sewing onto a hat to ensure the wearer of the Saint's protection. Enamel on gold, French, 15th century.

16th-century Italian pendant in the form of a triton, made of two baroque pearls, flat-cut rubies, diamonds and gold. The photograph is life-size.

This glittering apparition, the biggest and certainly the most unusual of the NCFA's "Hidden Aspects," is called *Throne of the Third Heaven of the Nations' Millennium General Assembly*—a title that seems to owe something to both the Book of Revelation and the U.N. Charter. It was lovingly assembled over a period of 14 years by one James Hampton, a government laborer who died in 1964. Using the products, new and cast-off, of today's supermarket culture, he set out to create nothing less than all the decorative and sacral appointments for the chancel of a church. The result is a meticulously balanced composition of chairs, tables, pedestals, cardboard cutouts, old jelly glasses, used light bulbs, pieces of mirror and other "found objects," all covered with aluminum foil and surmounted by the legend "Fear not." As it was discovered in a Washington garage after Hampton's death, no one now knows whether it was just a theoretical exercise in ecclesiastical decoration or intended for a specific church. No matter; as it stands it is an obscure man's dream of heavenly glory expressed in the earthly materials of plastic and foil—but every bit as convincing as, say, the plaster-and-gilt exuberance of a German Baroque church.

Photographed by Charles Phillips

FEAR NOT

RUTHERFORD
1749-1819
LAVOISIER
1743-1794
PRIESTLEY
1733-1804
HALES
1677-1761
BLACK
1728-1799
BOYLE
1627-1691
VAN HELMONT
1579-1644
STAHL
1660-1734
HERO
ABOUT 100 A.D.
ARISTOTLE
384-322 B.C
PARACELSUS
1493-1541
KEWICKI

By Isaac Asimov

Air, thin air, the formless element of the Greeks

Earth, air, fire and water—of these only air has substance but no shape, yet it formed a key part of modern chemistry

It was clever of the Greeks to consider air an element. It was clever of them to consider it at all, for most people—even today—ignore it unless it is polluted. Most of us look into a container full of air and say, "This is empty. There's nothing in it."

Of all the Greek elements, only air is invisible. Earth, fire and water are all about us; we can feel them as well as see them. Even ether, the fifth element that Aristotle thought made up the heavens, can be seen in the form of the glowing sun, moon, planets and stars. Only air is used as a synonym for nothing. In *The Tempest,* Shakespeare's Prospero magically produces a gorgeous entertainment, then lets it all vanish, and says:

"... These our actors,
As I foretold you, were all spirits, and
Are melted into air, into thin air. . . ."

That is, into nothingness.

Yet air is *not* nothing. A Greek engineer, Hero, who probably lived some time in the first century A.D., knew this. In his startingly modern-sounding book, *Pneumatics,* he says:

"Vessels which seem to most men empty are not empty, as they suppose, but full of air . . . composed of particles minute and light, and for the most part invisible. If then, we pour water into an apparently empty vessel, air will leave the vessel proportional in quantity to the water which enters it. . . . Hence it must be assumed that air is matter. The air when set in motion becomes wind (for wind is nothing else but air in motion) and if, when the bottom of the vessel has been pierced and the water is entering, we place the hand over the hole, we shall feel the wind escaping from the vessel, and this is nothing else but the air which is being driven out. . . ."

Nevertheless, though air was known to be matter and, in the Greek view, a fundamental element of the universe, it was different from all other matter. To begin with, it had no form, no shape. A quantity of water had no permanent shape but if confined would take on the shape of the container. Fire had a shape that perpetually changed but it was a definite shape of some sort at each instant of time. Ether, the Greeks thought, had the shape of the heavenly bodies. Only air had no shape at all.

The Greeks believed that the universe had been created by the imposition of form on a random, shapeless mixture of the elements which they called "chaos." When this original mass of unformed and unshaped matter became ordered, formed and shaped, it was "cosmos." To many Greek thinkers, it seemed that air, unformed and unshaped, was a remnant of the original chaos. Indeed, over a millenium later, the Swiss alchemist, Paracelsus (1493-1541) sometimes referred to air as "chaos."

Another distinctive characteristic of this formless element, air, certainly understood by the Greeks, was

When the men at left were done with it, air had been fixed, phlogisticated, dephlogisticated and found to consist of at least two new elements.

In the second of a series on the Greek elements—earth, air, fire and water—author Isaac Asimov traces the discovery of oxygen and nitrogen.

In the early 18th century, the versatile English botanist, Stephen Hales, developed a needed technique for analyzing the nature of air and also (above) studied the blood pressure of horses.

the fact that it seemed to remain permanently air. Water, for example, did not remain permanently water. If allowed to remain in an open container, water slowly disappeared, and if it were heated it readily changed into something that seemed to have the properties of air.

Air itself, however, could not be changed into any kind of water. When water was heated and the "air" formed from it was mixed with ordinary air, then that part of the air that had once been water could be turned back to water by cooling the mixture. But on the other hand, the air itself, the air that had always been air, remained air.

Taking note of this in 1620, the Flemish chemist, Johannes Baptista van Helmont (1579-1644), termed those varieties of air which could be formed from water or from other substances as "vapors." For air itself, he reserved the Paracelsian term "chaos," pronouncing and spelling it "gas."

The word did not catch on at once. For a long time vapors of all sorts were spoken of as "airs."

Van Helmont found that some vapors differed not only from air but from each other. By burning charcoal he obtained a heavy vapor which he called "gas sylvestre" ("gas from wood"). By heating organic matter he obtained another vapor which he called "gas pingue" ("gas from fat"). "Gas sylvestre" (which we now call carbon dioxide) would put out a candle flame, which ordinary air would not. "Gas pingue" (a mixture of what we today call hydrocarbons) would burn as air would not.

The mystical Van Helmont's different vapors went unstudied in detail by him and by others of the time, perhaps because of technical difficulties. The vapors were difficult to isolate for as soon as they formed, they expanded outward, mixing with the vast quantities of air all about, and were gone. So, despite Van Helmont's observations, it remained easier to believe that air was a single substance (though variations that made it heavy, or inflammable, might be imposed upon it).

In the 17th century various techniques for studying air had been developed. Scientists had learned how to pump most of the air out of a closed container to form a vacuum—a container that was really empty (or almost empty) and not just air-filled. They also learned the manner in which air could be compressed and made denser.

But, whether air was pumped out or squeezed together, it was still air—thinner or denser, but air.

As the 18th century opened, scientists were beginning to wonder about combustion. For the first time since Hero had experimented with steam, ingenious men were beginning to force the expanding steam produced from boiling water to do work. Primitive steam engines were in existence by 1700, and it was clear they would work only as long as a fire was burning under the boiler. Interest in what it was that made some substances burn, but not others, increased sharply.

At this time, a German chemist, Georg Ernest Stahl (1660-1734), advanced an explanation of the process of combustion. He said that substances were capable

of burning because they contained something he called phlogiston (from a Greek word meaning "to set on fire"). For the next 70-odd years Stahl's idea of phlogiston and variations of it were used to explain much that was mysterious about air.

As such a substance burned, it lost its phlogiston, and it was the rapid passage of the phlogiston out of the substance that was visible as fire. Thus, wood was rich in phlogiston, but the ash left behind after the wood had burned was phlogiston-free and would therefore no longer burn. Air gained a new and important role: It was a receptacle for phlogiston.

When wood burned, it seemed the surface pieces burned first because they were near the air which would accept the phlogiston. The inner pieces, not near the air, would not burn. They might give off vapors and char, but because air was not available, they would lose little if any phlogiston. Indeed, the "charcoal" that was formed in this way, which was lighter than the original wood, would possess a greater concentration of phlogiston and would burn with a hotter fire than ordinary wood .

An especially enduring contribution of Stahl's was his insight that the rusting of metals was somehow analogous to the burning of wood. According to his theory, iron, for instance, was full of phlogiston. As it rusted, phlogiston poured slowly out of it, too slowly to cause a visible flame or tangible heat, and the iron rust (or "calx" as metallic rusts were called at the time) that formed was utterly lacking in phlogiston.

Air, fixed and phlogisticated

Any decent theory, in explaining observations and systematizing facts, naturally raises new questions.

Although air readily accepted phlogiston, it would only accept so much and no more. Thus, if a piece of wood were burned in a limited supply of air—in a small, closed container, for instance—it would eventually stop burning. The air about it apparently would have gained all the phlogiston it could hold and might be called "phlogisticated air." The partly burned wood still had the capacity for burning, of course, and would burn vigorously if put into a fresh supply of air.

If that was the case, then, how did "phlogisticated air" differ from ordinary air? Were there any differences in properties other than the failure of the former to support combustion.

Such questions would be difficult to answer as long as chemists had no convenient method for isolating gases from ordinary air and studying them. Fortunately, the necessary technique was developed by 1727 by the English botanist, Stephen Hales (1677-1761). It occurred to him to form vapors in a closed container so that they could not mix freely with unlimited quantities of air. Instead, the vapors, as they formed, were led through a tube under water and into a second container which was upended with its surface below the water. The vapor bubbled up into the container, driving out the water. A glass cover could then be slipped under the open mouth of the container which would then be upended and would be full of vapor mixed with very little air.

Hales produced several different vapors in this fashion but continued to think of them all as merely trivial varieties of air. Fortunately, his younger contemporary, the Scottish chemist, Joseph Black (1728-1799) went further.

In 1756, Black strongly heated the mineral, limestone, and noted, as had others before him, that it decomposed, giving off a gas and leaving behind lime. When the lime was allowed to cool and then exposed to the gas that had been given off, it combined with the gas once more and formed limestone again. Because the gas could be "fixed," that is, made to combine with and become part of a solid substance, Black called it "fixed air." (This, like Van Helmont's "gas sylvestre," was what we today call carbon dioxide.)

"Fixed air" did not support combustion. What's more, it was formed when wood burned. Was "fixed

These pieces of glassware and equipment remaining from Priestley's laboratory in England are now in the collections of the Smithsonian. The rest are believed lost when Priestley was raided.

On display in the Smithsonian's Museum of History and Technology is laboratory equipment Priestley used in his experiments on air.

air" the same thing as "phlogisticated air?" Another of Black's observations permitted chemists to think this was possible. He allowed lime to stand in *fresh* air in which nothing had been burned. Very slowly, the lime changed over to limestone. From this, it could be seen that ordinary air contained a small quantity of "fixed air." One might deduce that even the freshest air contained a little bit of phlogiston, perhaps from all the fires that had poured phlogiston into the atmosphere through all of history.

And yet if "phlogisticated air" and "fixed air" were the same, "phlogisticated air" could not merely be ordinary air plus phlogiston. "Fixed air" was distinctly different from ordinary air in ways other than merely not supporting combustion. It was distinctly denser, it dissolved somewhat in water, it combined with lime, and so on.

This suggested another experiment, which Black's student, the Scottish chemist, Daniel Rutherford (1749-1819) carried through in 1772. Suppose a candle were burned in a closed container until it would burn no more. A burning candle formed "fixed air" and also "phlogisticated air." The "fixed air" could easily be removed by being bubbled through a solution of lime. If it were also "phlogisticated air" then any gas that survived passage through the lime solution would be free of phlogiston and in it a candle could burn.

Rutherford carried through the experiment. He formed the "fixed air" and removed it, finding that after its removal most of the volume of the original air remained. What's more, the air that survived passage through the lime solution seemed to possess all the properties of ordinary air. It was no denser than air, would not dissolve in water, would not combine with lime. Yet *it would not support combustion.*

It was this new gas which seemed to be "phlogisticated air" and that was what Rutherford called it.

Rutherford's "phlogisticated air" fitted the phlogiston theory much better than Black's "fixed air" did but it left behind one small crack in the common notion of air as a single substance. After all, there were small quantities of "fixed air" present in air, and now it turned out that "fixed air" was not merely air plus phlogiston, but was a distinct substance altogether. It remained true, however, that "fixed air," though present, was present in very small quantities, and so it was generally ignored.

To avoid confusion in names, let us remember that Black's "fixed air" is a minor constituent of the atmosphere and is identical with Van Helmont's "gas sylvestre" and what we now call carbon dioxide.

Rutherford's "phlogisticated air," though like "fixed air" in not supporting combustion, is a different substance altogether. "Phlogisticated air" is a major constituent of the atmosphere, perhaps all of it once phlogiston is added in sufficient quantities.

Another important discovery was made by the Englishman, Joseph Priestley (1733-1804), one that came about through a series of coincidental events. He was a Presbyterian minister (later turned Unitarian), whose hobby was chemistry. Since he lived next door to a brewery, the fermenting grain gave him ample supplies of "fixed air" to experiment with. In order to avoid losing vapors to water he began to collect vapors by passing them through mercury rather than water.

When mercury is heated in air, it will form a brick-red "calx." By the phlogiston theory, mercury con-

With bell jars and living creatures (left)
and by heating mercuric oxide with lens (a model),
Priestley found what would be called oxygen.

tained phlogiston which, under the influence of heat, would escape into the air, leaving the phlogiston-free calx behind.

In 1774, Priestley put some of this mercury calx in a glass container and heated it with a lens that concentrated sunlight upon it. The calx broke down to mercury again, for the metal appeared as shining globules in the upper portion of the glass container. In addition, the calx gave off a gas as it broke down, and this gas seemed to be very much like air in all its properties but one.

When Priestley thrust a smoldering splinter of wood into the glass container holding the new gas, that splinter burst into brilliant flame. Apparently phlogiston tended to pour into the new gas more readily than into ordinary air. Priestley decided this was because the new gas had smaller quantities of phlogiston in it than ordinary air did. After all, had it not been formed from the mercury calx, which contained no phlogiston, and under the influence of heat, which would tend to allow any phlogiston which might be present to escape?

Because it contained so little phlogiston, perhaps none at all, the new gas accepted phlogiston with particular avidity, and a piece of wood that barely smoldered in ordinary air would naturally burst into flame in it. Priestley therefore called the new gas "dephlogisticated air."

Priestley's "dephlogisticated air" did, indeed, seem to be the opposite of Rutherford's "phlogisticated air." Mice died in the latter, but were particularly active and frisky in the former. Priestley tried breathing some "dephlogisticated air" and found himself feeling "light and easy."

In 1774 the phlogiston theory was at the height of its impact but it was just about to disappear forever under the precise hammer-blows of a French chemist, Antoine-Laurent Lavoisier (1743-1794).

Lavoisier was a stickler for accurate measurement. In this he was not alone, of course. Joseph Black and others had made careful measurements in their experiments, but Lavoisier went about it more systematically. It was not enough, for instance, to show that under certain conditions wood would turn to ash. The question was: From a given quantity of wood, how much ash would form?

It was obvious, for instance, that when wood burned, the ash left behind weighed less than the original wood. This posed no mystery, for burning wood lost vapor and phlogiston, so naturally the ash would weigh less. How much of the loss, however, was vapor and how much phlogiston?

There was one way of answering. The rusting of metal involved the loss of phlogiston, but not the loss of vapors. Hence, any deficiency in the weight of calx was due entirely to the loss of phlogiston. But here came a shocker. It was easy to determine that when a metal rusted, it *gained* weight. A calx was invariably heavier than the original metal from which it formed. The *loss* of phlogiston alone seemed invariably to result in a *gain* of weight.

The fatal blow for phlogiston

No substance was known that had a negative weight, but Lavoisier's measurements drove many phlogistonists into accepting this uncomfortable conclusion. Lavoisier decided to test the matter in a new way. He heated metals such as tin and lead in closed containers, with a limited supply of air. Both metals formed a calx on the surface up to a certain point and then rusted no farther. But Lavoisier did something else. He carefully weighed the container to begin with and he then carefully weighed the container after the calx was formed. *There was no change in weight.*

Since it was known that the calxes were heavier than the metals from which they formed, that gain in weight must have been balanced by an exactly equivalent loss in weight in something else within the container. The only other substance within the container was air. Could it be then that the calx had formed not because the metal had lost phlogiston to the air, but *because it had gained something from the air?* If so, there should be less air in the container now than before, and the container should hold a partial vacuum.

To test this, Lavoisier opened the stopcock to the vessel and air rushed in. There had indeed been a partial vacuum within. When Lavoisier then weighed the container, it had gained weight in the amount expected from the formation of calx.

To Lavoisier, and to all chemists eventually, this was a fatal blow to the phlogiston theory. All combustion and all rusting was the result of the combination of air with the substance that burned or rusted. Phlogiston did not exist: All the known facts about combustion could be explained without any reference to it.

Yet Lavoisier remained dissatisfied. In the course of rusting or combination, not all the air would combine. Only about one-fifth of it would, and thereafter nothing could make combustion continue further. So casually did he accept the 2,000-year-old Greek assumption that air was a single substance that for a time he failed to see why one-fifth of it should act differently from the other four-fifths.

In 1774, Priestley visited Lavoisier in Paris and described his experiments with "dephlogisticated air," the gas formed from mercury calx, in which smoldering splints burst into vigorous flame. In a blinding flash, apparently, Lavoisier saw the truth of the matter. Ordinary air was one-fifth Priestley's "dephlogisticated air" and four-fifths Rutherford's "phlogisticated air," and only the former was involved in combustion. The difference between these two "airs" could not lie in the content of phlogiston, since Lavoisier had demonstrated to his own satisfaction that there was no necessity to assume the existence of phlogiston.

What he decided, instead, was that the two "airs" were utterly different substances—different elements—and that the Greeks and everyone following them had been wrong in assuming air to be a single substance. To emphasize this, Lavoisier gave the two "airs" different names. The "dephlogisticated air" he called "oxygène" from Greek words meaning "producer of sourness" since he was of the opinion that it was an essential constituent of acids. In this he was wrong, but the name, oxygen, has been kept ever since.

As for Rutherford's "phlogisticated air," Lavoisier renamed it "azote" from Greek words meaning "no animal life" since animals died if placed in it. This

name, however, did not survive. Since the substance was later found to form a constituent part of the common mineral, niter, it came to be called "nitrogen" ("producer of niter").

To emphasize the fact that air was not an element, but a mixture mainly of two elements, Lavoisier went back to Van Helmont's "gas" and established it as the general term for all airlike substances.

Rutherford retains the credit for the discovery of nitrogen and Priestley for that of oxygen, but it was Lavoisier who recognized their true nature. He served chemistry in many other ways—through his emphasis on measurement, his devising of the modern system for naming chemicals, his declaration of the important principle of the conservation of mass, his writing of the first modern chemistry textbook, and so on.

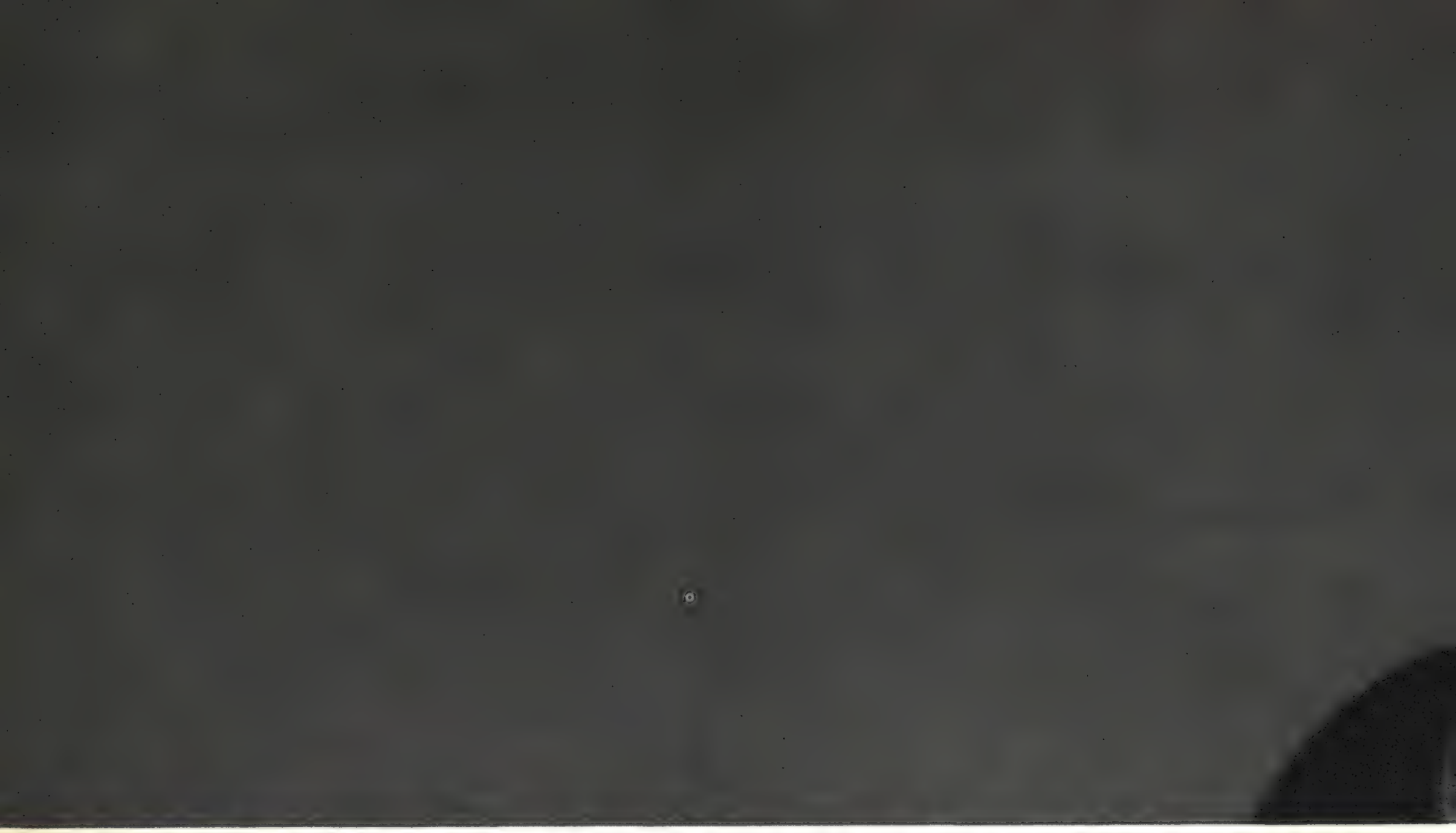
Nevertheless, his insight into the nature of combustion was sufficient, all by itself, to place chemists on the right track in their study of the makeup of the Universe. Through an understanding of the role of oxygen, chemists could work out the composition of the rocky oxides that made up the Earth's minerals. From a consideration of that composition, the atomic theory could be substantiated past doubt and chemical reactions, one by one, fell into orderly place.

From this profitable and enormously rewarding course, chemists never deviated thereafter. It is with full justice, then, that Lavoisier is known as the "Father of Modern Chemistry."

And he got all this started by a close study of air, which, to most people even today, is simply nothing.

Lavoisier, the father of modern chemistry, and his wife in a Jacques Louis David painting.

A nonchemical event, the French Revolution, forcefully interrupted the history of chemistry. Favoring the revolution, Priestley (left) was chased from his English laboratory to America. Across the channel, Lavoisier, who had hobnobbed with nobles, was apprehended in 1794 in his laboratory (above) and tried as an anti-revolutionary. Chemistry then lost one of its brightest heads.



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in the past week."

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"A lesson in the cost of living."

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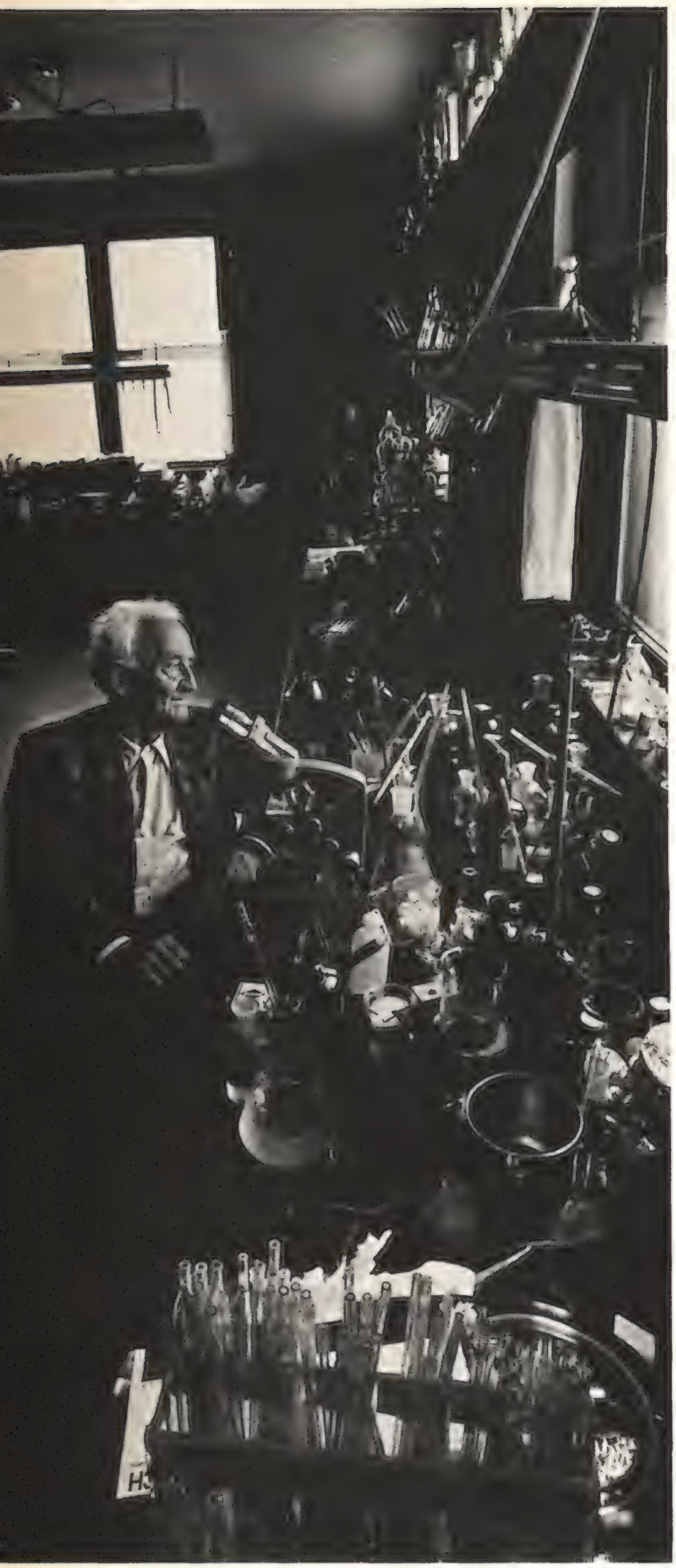


In his laboratory on Cape Cod, Szent-Györgyi works optimistically on cancer but despairs over the "gerontocracy" that rules the world.

By Helena Curtis

A Nobel scientist's gloomy outlook

Albert Szent-Györgyi, prize-winning discoverer of more than one of biology's secrets, believes that we are brigands

"Half the children of the world go to bed hungry and we spend a trillion on rubbish—bombs, planes and tanks. There is an old Hungarian saying, 'He who is silent among brigands is himself a brigand.' We are all criminals."

Albert Szent-Györgyi's blue eyes snap with impatience. Nobel laureate in 1937 for his part in the discovery of, among other things, vitamin C, he now lives and works in Woods Hole, Massachusetts, a tiny, sparkling, Cape Cod community that overlooks the waters surrounding Martha's Vineyard and Nantucket. His trousers are baggy and his tweed jacket is comfortably frayed, with leather patches on the elbows. An Einsteinian halo of white hair frames his sun-weathered face. But just beneath this deceptively gentle surface, one can sense the hard glint of anger.

What is he angry about? "The crazy idiots who run the world." One action of these crazy idiots was the cutting off of Szent-Györgyi's research funds. Until two years ago his laboratory was supported by a modest annual grant from the National Institutes of Health, but this support was withdrawn as part of the recent federal economy drive which has closed down many scientific research laboratories throughout the United States. He points out that the annual cost of his research is about the same as flying one B-52

Helena Curtis, a New York free-lance writer, is the author of the respected college textbook, Biology, *and several books for the general public.*

over Vietnam. The fund cutoff may have ignited the controversy but the issue in Szent-Györgyi's mind is clearly a larger one. "I personally am happy. I have my work, I live in this beautiful place," he gestures around him, "but this whole wonderful world could be wiped out any day."

Szent-Györgyi's research continues, as the result largely of private supporters, and his enthusiasm for it is undiminished. Each morning he walks to his laboratory from his home near the tip of a point of land that separates Vineyard Sound from Buzzards Bay. His path leads him along the water by the Department of Fisheries and the docks of the Oceanographic Institution (many of whose activities have also been curtailed by the same cutback in government research funds.) In the large plain building of the Marine Biological Laboratory, Szent-Györgyi has for the last decade been working on cancer, seeking the underlying mechanism that goes wrong. For example, he points out, you can cut away two-thirds of a rat's liver and sew up the rat and the animal will survive. If you examine the animal a week later, the liver will have completely regenerated. During this period it has grown faster than almost any cancer. But once it reaches its previous size, it stops—unlike cancer, which never stops growing as long as the organism itself remains alive.

A maverick in the cancer field

Dr. Szent-Györgyi believes that the stop-and-go signals for cell multiplication are controlled by chemicals. The promoter or starter he calls "promine" and the retainer he calls "retine." He believes that he is very close to the isolation in pure form of retine and that it will control cancer. If Szent-Györgyi is right, it will surprise most of his scientific colleagues among whom the virus theory of cancer now seems most promising. Szent-Györgyi is now regarded as a maverick in the cancer field, and mavericks are regarded with an often justified suspicion in scientific circles. However, it is difficult to dismiss the work of anyone whose previous investigations have been as brilliant—and all are agreed on this point—as Szent-Györgyi's have been.

This work on cancer has become very close to Szent-Györgyi's heart. During the time he has been engaged in it he has lost the two persons he loved best in the world from cancer, his wife and his only daughter.

"Today is the first time in man's history that he is able to truly enjoy life, free from cold, hunger and disease. It is the first time that he is able to satisfy all his basic needs. Conversely it is also the first time in his history that man has the capability of exterminating himself in one blow or making his tragically shrinking, lovely little globe uninhabitable by pollution or overpopulation. One would expect that any idiot could make a wise choice between these two alternatives. . . . Yet man seems to be bent on choosing the latter."

Compelled by this bleak vision, Szent-Györgyi has taken time from his work to speak out—his face is now becoming familiar on television talk shows—and to write two short books, *The Crazy Ape* and *What's Next,* each only about 40 pages long. ("Who the hell has time to read 300 pages?") In these books, Szent-Györgyi attacks the "gerontocracy" that rules the world, analyzes the roots of our present perils, and calls on the youth to try to save his "beloved adopted country" by bringing forth new leadership while there is still time—if there is still time.

War and politics are no strangers to Szent-Györgyi, and his feelings toward them were never benign. For Szent-Györgyi, who has always been first and foremost a scientist, science is the "hunt for the secret of life." The secret of life lies in biological order, the way things are arranged and organized in living materials. The hunt is a rational pursuit and life, in its fascinating complexity and order, has a high value. War and politics, on the other hand, are disorderly, irrational and threaten life.

Although his views may seem simplistic, one can hardly accuse him of having been sheltered. In his 77 years, he has been the privileged son of a feudal Hungarian aristocrat, a military defector from the Austro-Hungarian army (he still bears the scars of his self-inflicted wound), a spy in Istanbul and a refugee—by a hair's breadth—from Hitler's Gestapo.

Szent-Györgyi was born in 1893 into a noted family of Hungarian scientists. He describes himself as such an indifferent student that his uncle, a noted histologist, protested violently against his following a scientific career. Finally, after he had graduated from high

One rat with a healthy new liver, one with a cancerous liver: What is the mechanism that fails?

school with top honors, his uncle admitted the possibility of his becoming a proctologist. (His uncle had hemorrhoids.) So the future Nobel laureate's first scientific paper, written in his first year of medical school, dealt with the epithelium of the anus. (He places his early history on record, he says mischievously, because "it suggests that no final judgment should be made of children at too early an age.") Although he won international recognition for his early work, he soon became discontented with histology—"it told me little about life"—and switched to physiology, the field that has continued to occupy him for the rest of his scientific career.

During World War I he was drafted into the Austro-Hungarian army. He was decorated for valor, but subsequently became disillusioned with the war. Convinced that he and his comrades were being sacrificed senselessly, he determined that "the best service I could do for my country was to stay alive." So he shot himself through the bone of his left forearm and returned to science.

He finished medical school, receiving his degree in 1917, and was assigned to a biological laboratory of the army. He objected to medical experiments being performed on prisoners of war and was consequently transferred, as a disciplinary measure, to the North Italian swamps during a particularly virulent outbreak of malaria. However, within a few weeks the war collapsed and young Szent-Györgyi was free to return to his defeated and ravaged country.

After the war almost nothing remained of the family fortune which had, at one time, seemed to promise him an intellectual life free from intrusions. He spent the next years in a number of different countries, including Germany, Holland, England and the United States. And on the verge of abandoning his scientific career he was rescued by a Rockefeller fellowship at Cambridge, where he then received a Ph.D. in 1927.

During these years, Szent-Györgyi made the studies on plant tissue that led directly to the isolation—from oranges, lemons, cabbages and, finally, the richest source of all, his native paprika—of a chemical involved in particular types of energy exchanges in living tissue. He first called it "ignose," from "ose" meaning "sugar" and "ignosco" meaning "don't know." The editor of the scientific journal to which Szent-Györgyi sent his paper was not amused. "Godnose" was even less successful. So it was given the more acceptable though wrong name of hexuronic acid.

Subsequently, hexuronic acid was found to be identical with vitamin C, the anti-scurvy vitamin, and Szent-Györgyi's discovery made it possible for vitamin C to be made available for medical purposes in large quantities in pure form. (Szent-Györgyi is in accord with Linus Pauling about the usefulness of massive doses of vitamin C in preventing colds, although this contention of Pauling's is not widely accepted by the medical profession.)

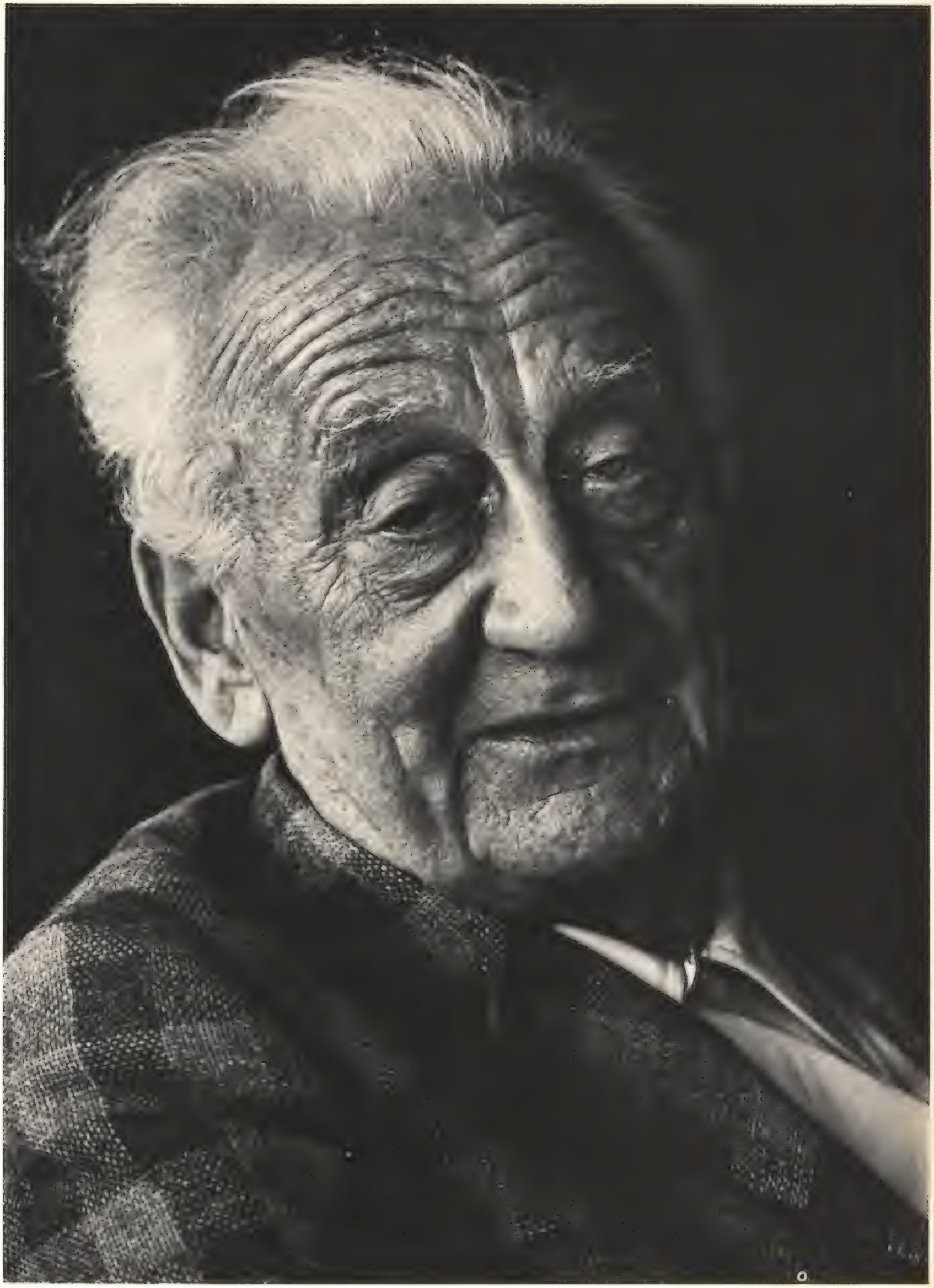
Studying the symptoms of life

He returned to Hungary in 1932 as president of the university at Szeged, but in the next few years he again was in conflict with the authorities. "It was not I who went into politics. Politics came into our lives and when books were burned and my Jewish friends were persecuted I had to say 'yes' or 'no.' I said 'no.' " Under cover of presenting a scientific lecture in Istanbul, he undertook a secret mission, conveying information and proposals for cooperation to the British secret service. There was a leak. Szent-Györgyi was placed under house arrest, and Hitler personally demanded his delivery. When the Nazis invaded Hungary, Szent-Györgyi and his wife, with their young daughter, had to go into hiding.

In the midst of the tumultuous 1930s, Szent-Györgyi received the Nobel prize in physiology for his work on the effects of vitamin C and on metabolism which opened the way to the understanding of the complex energy exchanges in tissues now commonly known as the Krebs cycle, after Sir Hans Krebs, also a Nobel laureate. By now, Szent-Györgyi felt he had enough experience to attack a more complex problem, one which could bring him "closer to the understanding of life."

Life, he points out, does not exist as an abstraction. We cannot see or study life but we can only study mat-

Just beneath Szent-Györgyi's deceptively gentle surface, one senses the hard glint of anger.



ter which has the symptoms of life. One of the symptoms of life is motion and, to study this symptom, Szent-Györgyi began his studies of muscle, the work for which he is probably best known. Szent-Györgyi discovered that muscle consists of two different proteins, actin and myosin, and, to the actin-myosin complex, he added a few ions and a newly discovered chemical, ATP (adenosine triphosphate), now known to be the universal carrier of energy in biological systems. (Szent-Györgyi describes ATP as a biological subway token which turns all the turnstiles of biochemical reactions.) And, right there in the test tube, this jelly-like formless mass condensed and twitched. Szent-Györgyi says that this was the most exciting moment of his existence, to see this age-old symptom of life recreated before his own eyes by these "lifeless" chemicals.

Working against Hitler and living underground, Szent-Györgyi expected to be killed if captured, so he wrote up his observations on muscle and sent them for publication to a Scandinavian scientific journal. The editor, a friend of Szent-Györgyi's, not knowing where to reach him, wired his acceptance of the article to him in care of the Swedish Legation. Unfortunately, by a complete coincidence, Szent-Györgyi was at that moment hiding at the Legation, and the wire gave him away. He was smuggled out by the head of the Legation in the back of his car just before the Nazis broke into the Legation, searched, robbed and practically destroyed it.

After World War II, Szent-Györgyi returned briefly to Hungary but he found the Soviets almost as impossible to live with as the Nazis. So he made his way to Woods Hole where he was able "by American generosity, to work unhampered by any factor other than my own personal limitations." And here he has remained, working in relative quiet, until recent months.

Szent-Györgyi is not bitter, only angry. He thinks about our present crisis as he would analyze a research problem. In his view, it results from the combination of the rapid changes which have taken place in the last few decades, with a leadership by men who are too old to change.

Man's brain, he points out, has been essentially the same for about 100,000 years, but the world he lives in has altered enormously.

The age in which we now find ourselves had its roots in the discoveries made at the turn of the century by scientists such as Max Planck, Wilhelm Röntgen and Albert Einstein. Their discoveries showed "that the ultimate units of our world were not rocks, caves, bears and the like, as man had thought before, but quanta, atoms, atom nuclei, radioactivity, electrons and electromagnetic radiation." The present age began on August 6, 1945, at 8:15 A.M., and the world has not been the same since and will never be again. We can no longer trust the kinds of observations and conclusions that have long served us so well. Man must adjust his old brain to new ways of thinking.

But this can only be done by the young, who are themselves a part of this age of quanta and electrons. Yet all of the world's leaders are men who were born

The scientist pauses on a breakwater: "This whole wonderful world could be wiped out any day."

and educated before 1945, men belonging to another age and so, according to Szent-Györgyi, seeking solutions by approaches that will no longer work.

To illustrate what he means, Szent-Györgyi mimics a caveman accumulating rocks to throw at his enemy. He is short and sturdy and, as he hops up and down on one foot in his baggy clothes with his imaginary arsenal under his arm, he looks like a street urchin of the silent movies. And now that man is no longer fighting with rocks but with bombs powerful enough to destroy the entire world, says Szent-Györgyi, still hopping, he is still accumulating those bombs as if they were rocks. "We now have enough to kill everyone in the Soviet Union three times over. It is seldom necessary to kill anyone more than once."

Szent-Györgyi does not blame our present dilemma on science. On the contrary, he views science as the "cutting edge of mankind." Besides, even if we wished to stop science until man reaches the maturity necessary to deal with the forces which science creates, it would not be possible. There is no way to stop human curiosity. The danger of our days lies not in knowledge or in the tools it creates, Szent-Györgyi believes, but in the fact that politics runs away with the tools. Science should not be suppressed but should be spread until scientific thought becomes sufficiently strong to create its own world order.

By this, Szent-Györgyi makes clear, he does not believe that the world should be run by scientists. Scientists are funny people: When Szent-Györgyi imitates a scientist, he hunches up his shoulders and shuffles around craning his neck to peer through an invisible microscope, indicating his obliviousness to the world around him. Men like to play games, he says. Men play chess. A scientist plays chess with nature. The scientific method—which he sees as a cooperative, calm, objective search for truth—should be used in the search for the solution to the world's problems. But Szent-Györgyi is not sanguine about the future.

"I see things as black," Dr. Szent-Györgyi explains rationally, "not because I am a pessimist, but because they *are* black. If I were 20 years old today, I would share with my classmates a rejection of the whole world as it is—all of it." In his opinion the drug problem can be solved only by creating a livable world and restoring the dignity of endeavor. Meanwhile: "Is there any point in studying? Fornication—at least that is something good. What else is there to do? Make love and take drugs against this terrible strain of idiots who govern the world."

By Joseph Barry

France's planners draw blueprints of an urban dream

Built-in pollution controls and a human scale will be prime attractions of Vaudreuil, a meticulously planned new city in Normandy

A little boy and girl idle along to school, only a few hundred yards away. Their feet never touch a road. They don't see an automobile. They walk on a mall, a level above the ground, as if in a quaint village suspended in a clear, blue sky. They live in Vaudreuil, a city free of noise, congestion and pollution. A dream? Yes, but one that is finding substance on Gallic drawing boards and may be a reality by the time today's babes-in-arms are second-graders seven years hence.

Now there is farmland in a bend of the Seine, a 20-minute drive east of Rouen and an hour's drive west of Paris and within longbow range of Richard the Lionhearted's medieval castle. Here the dream city of some 17,000 will soon touch the old Norman village of Vaudreuil and become the growing embryo of a community comprising 140,000 to 200,000 people by the year 2000. Its development will be so carefully observed that it may almost be considered a 10,000-acre test-tube baby, a human environment designed and built to be as close to perfection as alerted technology can make it.

The new city is part of the sixth national five-year development plan and President Pompidou has chosen Vaudreuil as a prime example of *his* kind of French grandeur. It is also fertile ground for realizing the terms of the recent bilateral agreement for U.S.-French cooperation in science and technology. Consequently, an interdepartmental group, headed by the Department of Housing and Urban Development, is participating in the project which Dale Barnes, H.U.D.'s director of international affairs, calls the most advanced attempt at comprehensive urban planning in the world today. Paul Brace, a Washington, D. C., urban-planning expert, has been posted in Paris to observe the city's conception and birth. He says the process will "take into account the complexities of social, industrial and environmental factors" with a copiousness seldom seen before.

What impresses anyone who visits the Vaudreuil Mission office is the systematic approach. A H.U.D. study group reports preliminary "land-use planning, microclimatology, hydrology and other site analysis; the analysis of industry, the home, communications and transportation; and the analysis of pollution reduction technologies."

Since 1967 groups of sociologists, social philosophers, engineers, architects, natural scientists as well as urban planners have been holding regular seminars. What, they have asked, is a city? What should it include? What should be built in a few years that has taken centuries to grow in the cities of France? They consulted people in the region. Almost universally they were told, "We want a real city. Not an extended suburb of Rouen."

The dormitory town may be a fine place for a commuting husband, who has his active public life elsewhere and comes home to sleep. But what about his wife and children, whom he sees so little and whose life is limited to the community? Why should it be assumed that he has to commute to work?

Such discussions led to a surprising discovery, in my view. What the people wanted in their modern city was an old-fashioned Mediterranean town, full of bustle but unchoked by the automobile and pullulating growth. So, fundamentally, the planners designed a town above and apart from the principal automobile roads, with a network of secondary service streets.

A totally new and different city

"The new city of Vaudreuil," says Oxford-trained urban planner Clive Harris, of the Vaudreuil Mission, "is not only more interesting than any English new town. It is superior to it. In England the system has been to allocate pieces of land for different uses, then to design a road pattern to fit the zoning pattern. Vaudreuil is anti-zoning. It is a *complete* city, with animation, choice and flexibility, commerce and compatible industry." By compatible he meant non-polluting, non-noise-producing light industry: laboratories, electronics, artisan workshops and the like.

"Animation" is a key word. With employment deliberately planned into the city, with offices, shops, a commercial center, public and private services, there will be a lively social mix.

Children will walk to school, mothers will stroll to market and breadwinners to work in Vaudreuil, which one day will comprise a collection of microcities.

Illustrations by John Douglass

"But won't that produce noise?" one asks.

"Human noise, compensated by the spectacle," replies Gérard Thurnauer, chief coordinating architect for the project. He cited the famous *piazza* of Siena, "where you have 'architecture,' space, activity and people living."

In Vaudreuil, homes will be acoustically insulated from each other, particularly in apartment buildings, and have terraces or gardens facing away from public places and thoroughfares.

As for inhuman noises, the Vaudreuil solution is to smother or eliminate their sources and separate them from people by imaginative three-dimensional planning. Pedestrians will use half-mile-long stretches of decks and upper-level terraces that turn and dip to garden paths.

"You might put it," says Jean-Paul Lacaze, 40-year-old government engineer in charge of the Vaudreuil Mission, "that the pedestrian will be favored. Approaches to cinemas, shops, libraries, schools, swimming pools and so on, will be from the pedestrian walks, not from the roads."

Plans for public transport involve electric buses and small electric delivery vans. Automobiles will have carburetors adjusted by municipal order for minimum pollution. Private vehicles, hopefully, will be discouraged by the persuasive success of efficient public transport. Fuels other than gasoline will be encouraged, then enforced.

Principal automobile arteries in sunken roadbeds will surround large urban modules, approximately 900-by-1,200 feet. They will be four-lane, one-way and have a system of staggered traffic lights for continuous forward movement to reduce noise and fumes. Heavier-than-air automobile pollution will normally not reach pedestrians crossing these roads on overhead

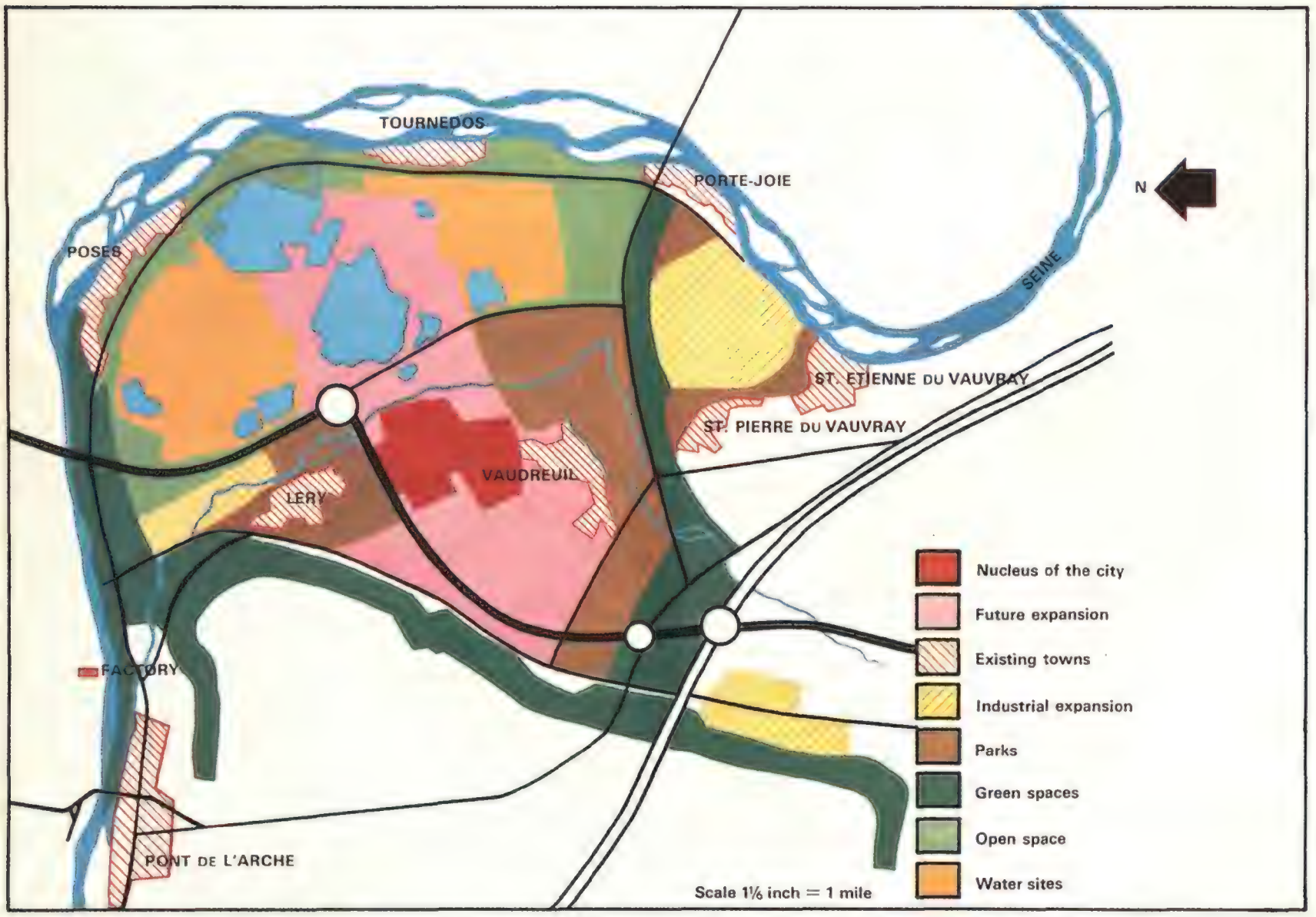
A frequent contributor to SMITHSONIAN, *author Joseph Barry wrote articles on Coco Chanel and the Paris Commune. He lives in France.*

passes which are extensions of the pedestrian decks and terraces. There will be no "sidewalks" along these principal roads or service routes, only along some of the secondary neighborhood streets within the large urban modules. Walls of buildings at the ground floor will be of sound-absorbing materials, such as porous brick. Those near main roads will be on pilings to lift them above the gas fumes.

Although the planners hopefully say that Rouen is usually downwind, it is difficult to cope with existing pollution in the area. The haze from industrial Rouen now is, at times, quite dense. Also, the Seine below Paris is badly polluted. Plans being made to solve both problems have high government priority. For instance, the pulp mill in the photograph on page 43 is due to be cleaned up.

One also notes the planners' awareness of "social pollution": the fatigue and stress of overcrowding, the morbidity of most urban life. Population in the new city will be kept to a density of about 40 inhabitants per acre. Buildings will have a maximum height of six or seven floors but average several less. Access to shops, jobs, public and private services, commercial and cultural centers will be by paths separated from roads. This is basic to the concept of Vaudreuil as a community in which the individual counts, because of the human scale.

To handle "conventional" pollution, industries must submit blueprints of decontamination techniques. Light, "compatible" industries will be located within the city proper; heavy industry will be exiled to the southeast, since the prevailing winds come from the north and northwest. There will be a waste-treatment plant for Vaudreuil sited at a distance from the now polluted Seine; industrial and domestic wastes will be piped to it, possibly through a Swedish system of pneumatic tubes. Garbage will probably help fuel a central city heating plant. Plastics may have a special disposal plant. Wastes will be channeled underground. Underground, too, will be immense galleries for parking, for commercial and residential storage space and for public utilities.



From a minicity of 3,100 acres, a metropolitan complex will grow, barely touching the seven ancient villages above. By the turn of the century, greater Vaudreuil's population may reach 200,000.

Opposite: View of Pont de l'Arche. The now-polluted Seine separates farms and forest on its way to Poses and Tournedos. At upper left is a paper mill that will be cleaned up during the ambitious project.

The Vaudreuil site is protected by fine forests, farmland, green belts and the high, dramatic bluffs of the Seine, which will all be protected. Meticulous inventories are being made of the region's bird, insect, animal and plant life so that continuous checks can be made. If populations change, it will be considered a grave failure of Vaudreuil's pollution controls and corrective steps will be taken.

Sailing and water-skiing in the Seine will be safeguarded and improved. Eventually Vaudreuil will have two lakes fed by the water table, instead of the polluted river. A golf course, a riding and jumping range, and a mountain-climbing school on the needle-sharp heights near the Seine bluffs will be kept intact in an easily reached recreational area.

The new city will lie among seven old villages (diagram, page 42), touching but not remodeling them. Time and the inevitable attraction of the new city will bring change enough, but not necessarily a loss of half-timbered Norman houses and village life adjacent to the modern city. Moreover, land outside Vaudreuil will be owned and controlled by the municipality, preventing speculative, mushroom growth of suburbs.

A remarkable feature of the plan is its built-in flexibility. It allows for internal change as well as expansion and leaves the way open for new possibilities in urban life that cannot now be predicted. The old approach to new cities was to design a procrustean bed and fit people into it.

The compromise at Vaudreuil has been to aim for an immediate "*germe de ville,*" or embryo city, based on the best that is known, and permitting its inhabitants to participate in plans for the future. In that sense Vaudreuil will be a continuing experiment with a perpetual plebiscite.

It is assumed that the basic principles, such as noise and pollution controls, limited density and building heights, separation of vehicles and pedestrians, will be maintained into the 21st century. The planning and building of the embryo city is based solidly on these principles. But no one knows in which direction Vaudreuil might next choose to grow within its large

urban limits, which quarters will become most important, what points will become most central, or what, indeed, will be its social and economic life in the year 2000. Revolutions in transportation or energy might make many things possible that are now inconceivable. With the choice of the large grid system of principal roads and the matrix of modules, Vaudreuil could easily extend in any direction and be serviced.

The basic structures of the buildings will be relatively permanent, but the dividing elements within them will be removable. In this way an office building could be converted into an apartment house. Many spaces will be multipurpose—a weekly market place can be used for bicycling or roller skating when there is no market, a warehouse can double as an experimental theater.

The fundamental flexibility will lie in giving the people of Vaudreuil a critical voice in future patterns, tailored to their future life-styles. Cable television alone can change the entertainment and cultural picture. What then of theaters, movie houses and perhaps schoolrooms?

The embryo city will be greater Vaudreuil in miniature—5,000 dwelling units on 500 acres. It will not be a dormitory waiting for an awakening, but a fully functioning community with the complexity of a self-contained town, providing jobs and services, recreation and schooling. It will not be an arm of the future Vaudreuil, but an infant body with all the components of the future city. And as it grows its very growth will depend on its observed experience, on the continuing dialogue between its inhabitants and its planners.

It is that aspect, particularly the plan for an international research and conference center in the embryo city, that seems most to have excited the official American team visitors. This plan provides an unparalleled opportunity for on-site monitoring of an experiment in progress: "Vaudreuil's new approach to marrying the concerns of urban development and environmental quality," as the H.U.D. task force report states.

For the people of Vaudreuil themselves the study center will be a cultural meeting place with an inviting forum, partly open, partly covered, towards which they will flow for a walk, a talk or informal assembly. The forum itself will have access to lecture halls, exhibition and study rooms, a documentation library, a small theater and a 600-seat conference room for international seminars. Here, conceivably, a branch of the University of Rouen might become Vaudreuil's School for Urban and Environmental Studies with student housing nearby. At hand, for a certainty, will be the offices of the Vaudreuil Planning Mission, transformed literally into the Vaudreuil Public Establishment, with all the authority implied.

The study and cultural center will be one polar

Antique houses in neighboring towns will be preserved to harmonize with the new city's varied architecture.

Before heavy industries may locate in Vaudreuil, they must provide totally effective pollution controls.

Promenades, parks and terraces serenely dominate the cityscape. Cars and electric buses ply sunken roads.

attraction.Another, 1,000 to 2,000 feet away, will be the commercial center and its large shops. This is ordinarily the busy, congested, "downtown" center, sometimes called the "heart," of the city, difficult to reach or enjoy, a tangle of traffic jams. At Vaudreuil, however, the shopping area will be for pedestrians. The axis between this pole and the cultural center will be a pedestrian promenade, uncrossed by roads, with garden spots, sidewalk cafés, restaurants and boutiques. There will be other polar centers as well, each with complementary services, structures and facilities.

There is repetition of schools, shops, pools, day nurseries and the like as one studies the plans for greater Vaudreuil. The multiplication of centers and facilities is itself an essential part of the basic concept of *decentralization.* Each neighborhood is to have its own lively mix of lodgings, commerce and services: drugstores, food shops, laundries, barbers and bakeries, as well as schools, playgrounds and nurseries. These, too, will be related so that walking is not only pleasant but the most practical way of reaching them.

Minute studies have been made establishing ideal groupings—the distances and relationships between centers, services and residences. Here the sociologist has tutored the city planner and architect, and all have drawn not only on French research, but findings in England, Scandinavia and America. A project of obvious national importance, which will influence the renovation of old French cities as well as the building of new ones, Vaudreuil already promises to have international impact. Even before the new city is built and its life experienced, the methodological approach of its planners—their "invention of a new way to make a city," as they put it—has made a contribution.

To what extent will the ideal be realized at Vaudreuil? Its principles are fixed and unchangeable ("That boy and girl *will* walk to school," overseer Lacaze promises), but there will inevitably be some give-and-take in the construction. Consultation will be intense with the builders' architectural team. Architecture itself may vary but building heights, volumetric and spatial relationships will be held to.

"That is one reason Washington is so interested in the Vaudreuil project," says U.S. Planner Brace. "We can still participate in it and make our own suggestions and criticisms."

One criticism is that the greatest source of noise—in a city designed to be as noise- and nuisance-free as technology permits—will be the sound of its own building over the next decade.

"True," says architect Thurnauer, "but what a spectacle!"

By Nicholas Rosa and Raymond B. Manning

The tidal areas—still the home of abundant life

The littoral, alternately beaten by surf and seared by sun, is a fecund environment for thousands of specialized species

The seashore is where all our worlds meet. Distinct as it remains from all others, it is part of all of them. It is a line of union rather than separation. This is an edge world, like the familiar boundary between a forest and a grassy meadow. Like many such landward boundaries, the shore holds a greater variety of life forms than the separate areas that it joins. But unlike landward boundaries, the shore has a community completely its own that cannot possibly survive anywhere else.

Knowing the seashore can require an adventurous spirit, an eagerness to explore—except perhaps on the most generous rock ledges where tide pools may abound and much can be found in a little space, a little time. The typical beach of sand or pebbles appears so quiet, so barren. For the most part it *is* barren. But there is more to the seashore than a ribbon of sand or a wall of cliffs where the land ends and the ocean begins. There is everywhere the littoral —the periodically wetted zone between the extremes of low and high tides.

Here life may lurk a few inches beneath a deceptively flat water surface. Or it may be holding on

Nicholas Rosa, now a free-lance writer based in California, was a physical oceanographer at the Woods Hole Oceanographic Institution early in his career. Dr. Raymond B. Manning is chairman of invertebrate zoology at the Smithsonian Institution's National Museum of Natural History.

The chromatic littoral—home for myriad plants and animals. Here lime-green anemones cling to a Pacific rock, some of them retracted, others distended in the tidal water. Scarlet clusters are sponges. The purple growths, coralline algae, cousins of the brown *Laminaria* (top). Starfish seek crevices (bottom).

for dear life in the boiling surf. It is not really the same thing as "sea life"—the residents of the littoral are not deep-water sailors. This is their world, at the edge of the land. And here, in an acre of littoral, you will find far greater numbers and varieties of animals than you would see in several square miles of the African veld.

Living between the tides, organisms must be peculiarly tough and resistant. Nowhere else on Earth do such quick and drastic changes in living conditions occur, day in and day out. The contrasts of "climate" that sweep the littoral every few hours can be as sharp as the change of seasons on land.

Periodically the tide recedes, leaving sand, mud or rock uncovered. Intertidal marine organisms have an oxygen problem because most are equipped to breathe only the oxygen dissolved in water. They are also beset by temperature extremes, desiccating winds, burning sunlight, drenching rain and above all probing predators: seagulls, men or both. If you happen to be a clam, you have problems—and very little brain to solve them with.

When the tide comes in it usually brings a thermal shock to every living thing it overruns, for the incoming water is so much colder or warmer, depending on the season, than the exposed sand or mud or rock. The water left in shallow pools will have reached the temperature of the surroundings—and then the tide-zone animals have to adapt again. After millions of years of this, they take it without a shudder.

Breaking waves pound the littoral as tides change. On exposed coasts, heavy surf may tumble without letup for days at a time. Yet animals with seemingly fragile shells withstand breakers that would smash sturdy boats.

To live in waves and surf, plants and animals must be adapted by habits as well as by form and structure. Almost everything is prepared to yield, to accommodate, to lie flat, to shrink into crevices or roll in avalanching sand. A hiding starfish spreads itself, sets its thousands of tiny suction feet, and clings so closely to a rock face that it might be part of the rock. Limpets lock themselves to rocks against the waves, while seaweed streams in the direction of flow, twisting and undulating with the agony of the surf itself. A clam or sand crab digs for shelter, but remains shallow enough to feed and to move up and down the beach with the surf. A tube-building worm

Tidal extremes at Copalis Beach, Washington, mark the boundaries of the littoral—the worldwide habitat that supports even more varied life forms than the land and hardier plant and animal species than the sea.

keeps to the bottom of its burrow when it's exposed, but can be found near the top as the tide comes in. A delicate porcelain crab wedges itself under a rock ledge if it can—or surrenders, retracting its legs and letting the waves skip it and bounce it where they will. If it gets a moment's respite, the crab will find a sheltering rock. Or perhaps it will be destroyed.

Some organisms can stand up to the surf. The sea palm, for example, a graceful foot-high seaweed, looks like a puppeteer's version of its namesake. It lives on the rocks toward the deeper edge of the littoral, and is found, in California, at least, just landward of the surf at low tide.

Tides, surf, sun, wind, cold, heat—this is how it was in the Cambrian, too. The exact life forms have changed and increased in number and variety. But the fossil record shows striking similarities between what we can find today and what was struggling to live then. What we see now is a habitat that has been hanging on to the spinning planet for half-a-billion years.

You may glimpse a little of the littoral community in a good tide pool or set of pools, running from the level of high tide to the margin of the lowest tides. The highest pools are the least diverse; their waters are not replenished quickly enough or often enough and environmental factors are too extreme for many organisms to get established. But go down farther, and you begin to find a series of small aquatic zoos and arboretums.

Specialized species at separate levels

In these pools and on the surrounding flats, many phyla of animal life appear in small compass. Except for insects, practically all animal classes can be found. If you see no conspicuous fishes to represent the vertebrates, you can usually find a little elongated blenny or goby, biding his time under a loose rock. Some other unfamiliar animal forms will seem so bizarre they will upset all your assumptions about what an animal ought to be and do.

In the littoral, different bands of organisms can be seen at different levels. In the Florida Keys, for example, life zones are marked by distinctive bands of color. The highest belt of rock, abutting the dry-land vegetation, is mostly white or off-white and holds no fully marine animals. The next zone is grayish—wetted by high spring tides. It is host to various snails and other forms of marine life. Next comes the so-called black zone, where spring tides wash. Much of its discoloration comes from blue-green algae. Finally there is a yellow zone, truly intertidal, containing a great number of marine organisms. Here the full richness of littoral life is found. Below it lies

A larval shrimp, about half-an-inch long, lives offshore in the open sea where it feeds on plankton. Mature individuals return to the littoral where they breed and spend their adult lives.

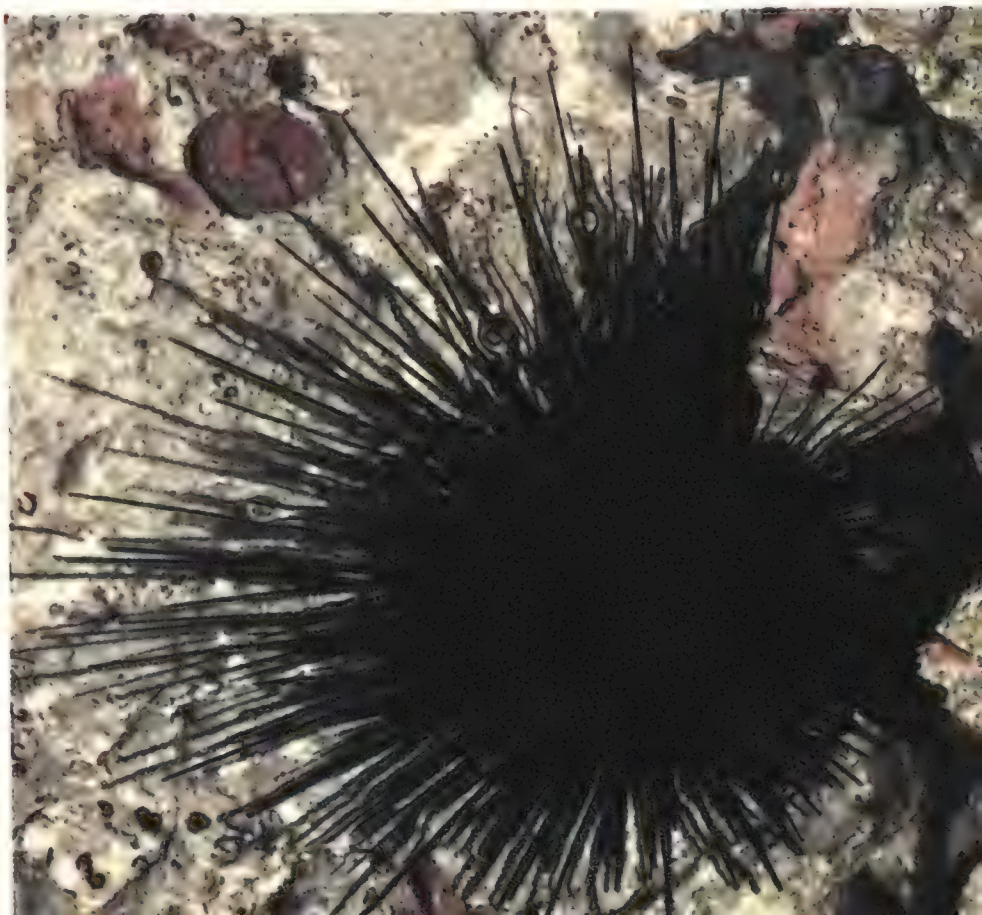
Sea turtles also inhabit open water, but would die out without littoral sands in which to lay their eggs. Below, a porcelain crab *(Porcellana sayana)* at home—here sharing the shell of a living queen conch *(Strombus gigas)*. They often cohabit with hermit crabs too.

Light-green surf grass *(Phyllos pedix)* springs from algae-bearded rocks at Tatoosh Island, Washington.

Two starfish *(Pisaster ochraceus)* in different color phases twine their ponderous way among

Buds of a sea anemone *(Epiactis prolifera)* ring their parent before breaking off to start new colonies.

Caribbean sea urchins *(Diadema antillarum)*, grazing in shallow water, can stab unwary swimmers.



anemones off Point of Arches, Washington. Bony structures cause their lacelike patterns.

Rooted above high tide's reach, *Sesuvium maritum* is watered by surf spray. It succors a small snail.

the reef flat—so varied as to constitute a different world. Limpets, barnacles, periwinkles and several kinds of algae are the most abundant visible forms of life in the intertidal zone.

Practically all animals of the shore are prolific breeders. Each female may produce up to hundreds of thousands of offspring in a single season or even upon a single occasion. The astronomical number of eggs are simply released into the water; the males discharge their milt, and fertilization takes place at random. Some organisms engage in sexual coupling, and the fertilized eggs or the larvae that develop from them drift with the tides and currents—joining the local plankton population. Eventually the lucky ones find the proper kind of rock, mud or sand, or the properly located tide pool, and settle down to grow. But most serve as a food supply for other, progressively larger animals.

Breeding against fate is an uphill road, but has more than one route. Some animals employ asexual budding. A piece of the "parent" simply breaks off and becomes a smaller, but more or less complete, individual. Other organisms engage in "alternation of generations." Every other generation reproduces sexually: The budded-off generation are male and female and release eggs and milt into their environment. Resulting larvae that survive grow into adults that bud or pinch off. Some littoral animals beat the hazards of the sea's shifting tides and swirling cur-

The Bermuda Deep gives up pelagic amphipods—corpses feed fauna of Bermuda's littoral.

rents by producing fewer but better-protected young.

Practically all seashores have snails that cannot stand being submerged for very long. They'll drown. They live intertidally and even above the high-tide line, feeding on the lichens and algal fuzz of the rocks. They would appear to have progressed far toward being land snails. Yet, at breeding time, they must go back to the water's edge and release their egg capsules into the sea. In contrast, other related snails from the same habitats lay egg masses on seaweeds and yet others retain their fertilized eggs within their shells. The young develop in armored protection until they are ready to cope with the environment. It is the latter snails, more like "sea animals" in their habits than some of their high-living cousins, that have come farther toward being land snails. They are effectively "live bearers."

On many coasts, crabs walk the dry land for long periods of time. In the tropics, land crabs may be found rather far inland within human cities, loitering in the doorways of their burrows under roadside hedges. Many tropical beaches in the Pacific have monster crabs that climb coconut trees, to husk and eat the nuts. Most land crabs must make periodic contact with water just to wet their gills and so breathe. And typically they return to the sea at breeding time. Baby crabs and shrimps of most species usually start life as a microscopic free-swimming larva with a shell, legs, but no claws—nothing that would give it the slightest chance on land.

Water animals have sired dynasties of land animals time and time again throughout the history of life on Earth. But evolution is not something that was only happening long ago. It's "happening" now, and if you'd like to inspect the happening, go to the seashore where you can hardly miss the way varieties of life respond to their environment.

We have been prowling the littoral and have not looked at the wetlands—the stream estuaries and tidal marshes. Here, too, life proliferates and evolution goes on. In marshes and estuaries a great deal of the land life that "wants to be sea life" is most visible. Here the birds we label "sea birds" usually have their nesting grounds, although a few, such as certain gulls and cormorants, will nest only on sea cliffs. But the marsh is also the feeding ground for herons and egrets and other "land birds" that nest in trees on the higher, dry land.

Wetlands can be thought of as extended littoral, but they have an identity of their own, as will be shown in a subsequent issue of SMITHSONIAN. They have potentials for exploration and enjoyment, but they are another world and another story.

Stretching for miles around the continents and islands, the seashore is the dormitory and place of business for enormous numbers of individuals of a staggering variety. These residents lead different but interlocking lives. Their habitat has lasted since the beginning of life.

Here, as in the forests or the mountains, time can be suspended. Things are what they were, more permanent than the man who finds himself there. Here human hubris encounters its limit. Any piece of wreckage of a jetty or a ship is just a relic of Ozymandias, Shelley's deserted "king of kings." Yet it is not a relic of despair. It says only that man must take his welcome on nature's terms.

At St. Paul Island, Alaska, the ubiquitous periwinkle clusters on bared rocks. Various species of these gastropods range from the tropics to the Arctic.

Busy night at a crab crossing: Tracks of nocturnal land crabs and ghost crabs mark a Caribbean beach awaiting the next high tide to wash them clean.

By Richard Bales and Scott Hart

Soldier songs have been stirring but they also reflected war's grimness

The fighters of today are hardly following the legacy of military music, such as 'Yankee Doodle,' 'Over There' and even 'Lilli Marlene'

Will America's fighting men ever sing again with hearts pounding for The Cause? It does not seem so in these days of My Lai and Kent State. But what our soldiers have sung across the past is irremovable from our heritage and indeed reflects the age-old gripes against combat, and sometimes expresses today's outcries against war—often against The Cause itself.

Peel off the protests—and the years—and listen to the lonesome man and the dusty column and reflect on why they sang so much. Innocent? Or did they really see and accept a reason for what they were doing? And beside their cause, death was only small, and singing was a means of forgetting the moments when even the urge to duty dies.

An old World War I soldier remembers seeing his sergeant moving through the Argonne brush. A shell crashed through the treetops and blew the sergeant apart as he sang *Memories,* a thing about childhood.

A Marine corporal remembers fondling a glass of cognac in a French cellar bar, watching indifferently another Marine moving his fingers at random along the keys of an old piano. A tune came, then lyrics:

> Smile the while you kiss me sad adieu
> When the clouds roll by I'll come to you
> Then the skies will seem more blue
> Down in lovers' lane my dearie
> Wedding bells will ring so merrily
> Every tear will be a memory
> So wait and pray each night for me
> 'Til we meet again.*

It was the first time the corporal had heard that song.

Origins of some songs have baffled students. For years *Yankee Doodle* has tantalized them. Its earliest datable words were put down soon after the capture of Louisbourg, the French fortress on Cape Breton Island, by New Englanders in 1745, and by the late 1760s the song had captured the Colonies. After the embattled farmers fought the redcoats by Concord Bridge in 1775, the music was published in broadside as *The Lexington March,* and it was in that version that *Yankee Doodle* reached England. Tradition has it that at Yorktown, in 1781, the tune was whistled and thumped by Continental Army musicians. The beaten British countered with the prophetic *The World Turned Upside Down,* probably to the tune of *The Bear Went Over the Mountain.*

After passing through many versions and parodies, *Yankee Doodle,* early in the 1800s, crystalized into the song we know today—thanks to one Yankee Hill. He searched out the old words:

> Father and I went down to camp
> Along with Captain Goodin'
> And there we saw the men and boys
> As thick as hasty puddin'
>
> Yankee Doodle keep it up
> Yankee Doodle Dandy
> Mind the music and the step
> And with the girls be handy

William Billings, an eccentric tanner, contributed *Chester,* excellent for marching, despite its words:

> Hark, hark, hear the adjuration;
> Cursed be the man that keepeth back his sword!
> Oh, dismal! oh, horrible! oh, dismal!
> My bowels! My bowels!
> I am pained at my very heart!
> My heart maketh a noise within me,
> For thou hast heard, oh my soul! the alarm of war.

Billings was raucous of voice and inelegant of manner, but manifested his inner graces as a singing

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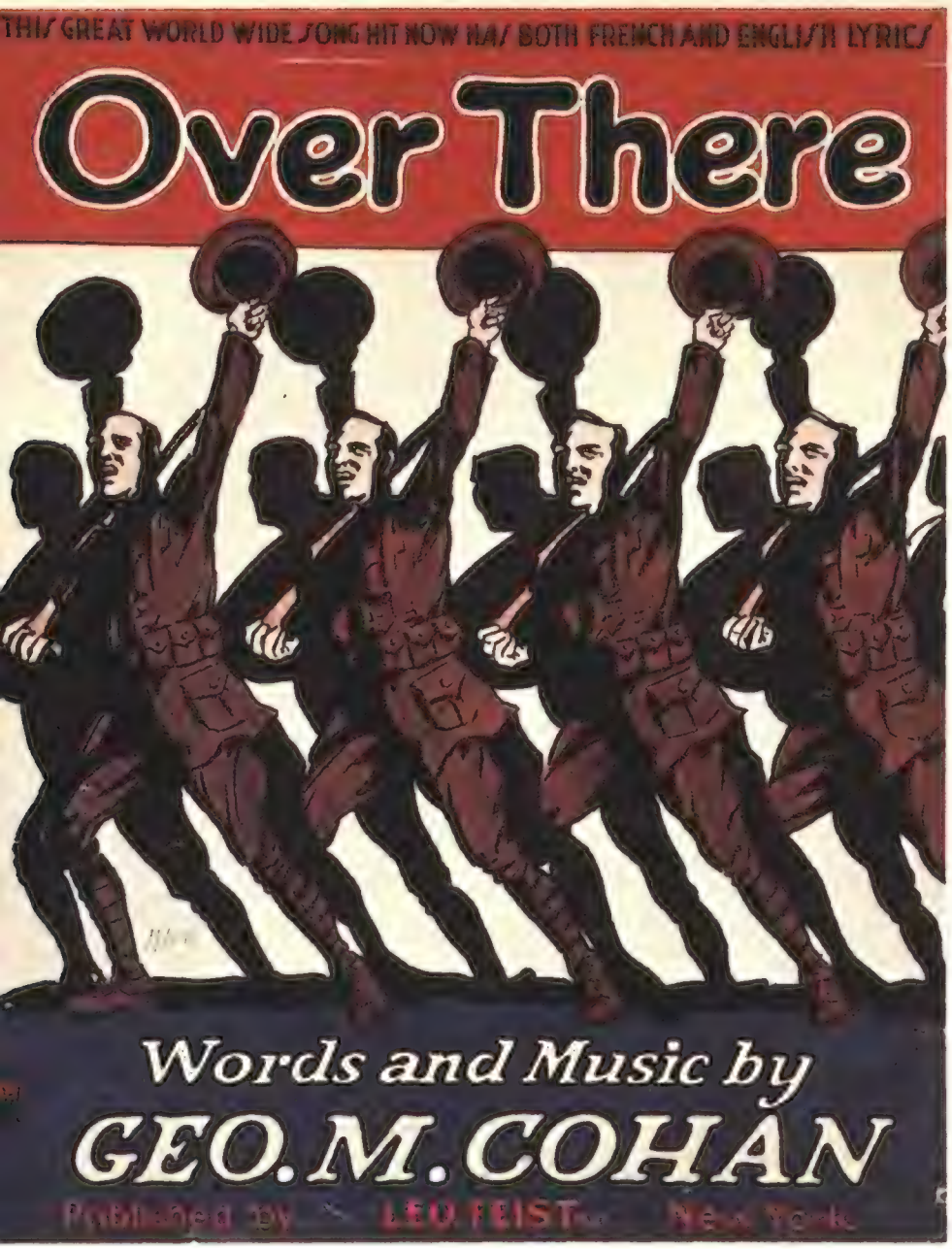

THIS GREAT WORLD WIDE SONG HIT NOW HAS BOTH FRENCH AND ENGLISH LYRICS
Over There
Words and Music by
GEO. M. COHAN
Published by LEO FEIST New York

master. He was blind in one eye and short in one leg. Yet his zeal was a log on revolution's fire, and he became, according to Sigmund Spaeth, "our first popular composer."

In Philadelphia, Francis Hopkinson, lawyer, inventor, signer of the Declaration of Independence and musician, brought out *The Battle of the Kegs* in 1778 to aggravate the British. They had, it appears, opened fire on everything in sight when floating powder kegs exploded near their battle fleet in the Delaware River.

Melodies knew no political boundaries

The British, too, were responsible for the melody of *The Star-Spangled Banner* (SMITHSONIAN, July 1970). The *Baltimore Patriot* printed Francis Scott Key's poem, saying it might be sung to the tune of *Anacreon in Heaven*. The original song had been the official song of the Anacreontic Society, a London musical club devoted to praise of wine and women—all honoring Anacreon, ancient Greek patron of them both. As an American song it seems to have won its first acclaim when Ferdinand Durang, an actor, leaped upon a Baltimore tavern chair and cut loose.

Though unpopular, the War with Mexico (1846-1848) sprouted songs both humorous and serious. Much was made of the capture of Mexican General Santa Anna's carriage, trunks of silver and cork leg after the battle of Cerro Gordo. Our soldiers sang to the tune of *The Girl I Left Behind Me:*

> I am stumpless quite since from the shot
> Of Cerro Gordo peggin',
> I left behind, to pay Gen. Scott
> My grub, and gave my leg in.
>
> I dare not turn to view the place
> Lest Yankee foes should find me,
> And mocking shake before my face
> The Leg I Left Behind Me.

In the war's final months, when home emerged from a dream to a probable reality, the songs changed—as soldiers almost invariably alter their singing to fit conditions. *We Are Coming Home* resounded around Vera Cruz at embarkation time:

> We are coming home! The battle's din and strife is passed,
> And war's wild notes are hushed in sweet repose;
> The cannon's roar and the shrill bugle's blast
> Call out no more for vengeance on our foes.

The Civil War inspired the best of all war songs. Fighting men and civilians alike were convinced that they weren't following a misty star but a compelling cause. Their songs unbared their souls.

In the first year, up came *Battle Hymn of the Republic,* dramatically wrought from the sight of campfires and marching men, but expressing visions beyond the sweep of eyes. The tune is southern, from a camp meeting song called *Glory Hallelujah.* It became *John Brown's Body* to northern troops, then Julia Ward Howe set to it the words now known throughout the western world.

Atlantic Monthly magazine carried her poem anonymously in its February 1862 issue and paid her $10. The Federal troops seemed unimpressed by any prospect of "the coming of the Lord," but wanted to come to grips with Lee's seemingly indestructible army and wanted to hang Jefferson Davis to "a sour apple tree." That parody held to the war's end. With the job finished—though Davis was not hanged—the parody vanished from all but history.

The emotions generated by rebellion were partly

Conductor of the National Gallery Orchestra and a student of American music, Richard Bales has made special studies of patriotic songs of the Revolutionary and Civil War eras. Scott Hart is a journalist who wrote Washington at War: 1941-1945, *which was published by Prentice-Hall last year.*

To my sisters Mary and Fannie, old Homestead Richmond, Ontario Co. N Y
YANKEE BULL RUN ROBINSON
An original Comic
YANKEE SONG
Written and Sung
thousands of times by
the
GREAT YANKEE
Lafayette Lodawick Robinson
Published by P.L.HUYETT & SON, St.Joseph.Mo.

satisfied in the South by *Dixie,* a song of northern origin, written by an Ohioan and first heard in the New York appearance of Bryant's Minstrels in 1859. Union troops marched to it, then Confederates adopted it. Its effect has been strange. Whereas the *Battle Hymn* has been proudly accepted by all sections of the nation, *Dixie* was always suspect and, indeed, is now denounced as an affront to civil rights.

The *Battle Cry of Freedom* was actually the North's *Marseillaise*—it expressed an ideal and it made men fight in defeat. In the Battle of the Wilderness a section of the Union line was outflanked and broke. In the uproar a soldier of the 45th Pennsylvania shouted the song at the top of his lungs, and it carried down the tumult. The lines reformed:

> Yes, we'll rally round the flag, boys,
> we'll rally once again,
> Shouting the battle cry of Freedom,
> We will rally from the hillside, we'll
> gather from the plain,
> Shouting the battle cry of Freedom.
>
> The Union forever, Hurrah, boys, Hurrah!
> Down with the traitor, up with the star;
> While we rally round the flag, boys, rally once again,
> Shouting the battle cry of Freedom.

The *Battle Cry* did not escape soldier humor. They sang on long marches, or by firelight:

> Mary had a little lamb,
> 'Twas always on the go
> Shouting the battle cry of freedom
> So she staked it on a grassy slope
> Along the Shenando',
> Shouting the battle cry of freedom
>
> Hurrah for Mary! Hurrah for the lamb!
> Hurrah for the sojers, who didn't care a damn,
> For we'll rally round the flag, boys. . . .

The South had something modestly resembling the Union's shout, titled *Cheer, Boys, Cheer!* or *Morgan's War Song.* Quite likely it arose from the feats of cavalryman John Hunt Morgan and his famous raiders:

> Bring forth the flag, our country's noble standard,
> Wave it on high 'till the wind shakes each fold out;
> Proudly it floats, nobly waving in the vanguard;
> Then cheer, boys, cheer! with a lusty long bold shout.
>
> Cheer, boys , cheer! We'll march away to battle,
> Cheer, boys, cheer! for our sweethearts and our wives,
> Cheer, boys, cheer! We'll nobly do our duty,
> And give to the South our hearts, our arms, our lives.

Around the turn of the 20th century many Southern girls were named Lorena. This name came out of the Civil War from what Stephen Vincent Benét called that "Sentimental army, touched by 'Lorena,' touched by all lace-paper-valentines of sentiment." Originating in Chicago in 1857, the song was seized by the South:

> The years creep slowly by, Lorena;
> The snow is on the grass again;
> The sun's low down the sky, Lorena;
> The frost gleams where the flowers have been.
> But the heart throbs on as warmly now
> As when the summer days were nigh;
> Oh! the sun can never dip so low
> Adown affection's cloudless sky.

There was a prevailing myth in some quarters that many slaves liked slavery. But there is a stronger probability that when they "looked over Jordan and what did I see, coming for to carry me home," they were thinking of the Ohio River and an escape into Canada via the underground railway. So black soldiers sang mostly of liberation, and two songs, *Many Thousand Gone* and *Kingdom Coming*, dominated their martial marching repertoire.

No more auction block for me,
No more, no more,
No more auction block for me,
Many thousand gone.

No more driver's lash for me,
No more, no more,
No more driver's lash for me,
Many thousand gone.

This somber mood broke wildly as Negro voices rose from Richmond's burning streets on the morning of April 3, 1865, when General Godfrey Weitzel's black and white troops entered the Confederate capital. As recorded in minstrel dialect by a contemporary writer:

Say, darkeys, hab you seen de massa,
Wid de muffstash on his face,
Go down de road some time dis mornin',
Like he gwine to leab de place?
He seen a smoke way up de ribber,
Whar de Linkum gunboats lay;
He took his hat an' lef' berry sudden
An' I 'spec' he's run away!

De massa run? ha, ha!
De darkey stay? Ho, ho!
It mus' be now de kingdom comin',
An' de year ob Jubilo!

Another verse:

De oberseer he make us trouble,
An' he dribe us round a spell;
We lock him up in de smokehouse cellar,
Wid de key t'rown in de well.
De whip is lost, de han'cuff broken,
But de massa'll hab his pay;
He's ol' enough, big enough, ought to know better
Dan to went an' run away.

Sensitive though the subject was to Southerners, they too sang *Kingdom Coming*. One chronicler states it won applause "in well nigh every house in Virginia."

Meanwhile, back at the battle, decimated Confederate forces retreated toward Appomattox almost silently in perhaps history's finest journey's end. They did find voice for one old favorite:

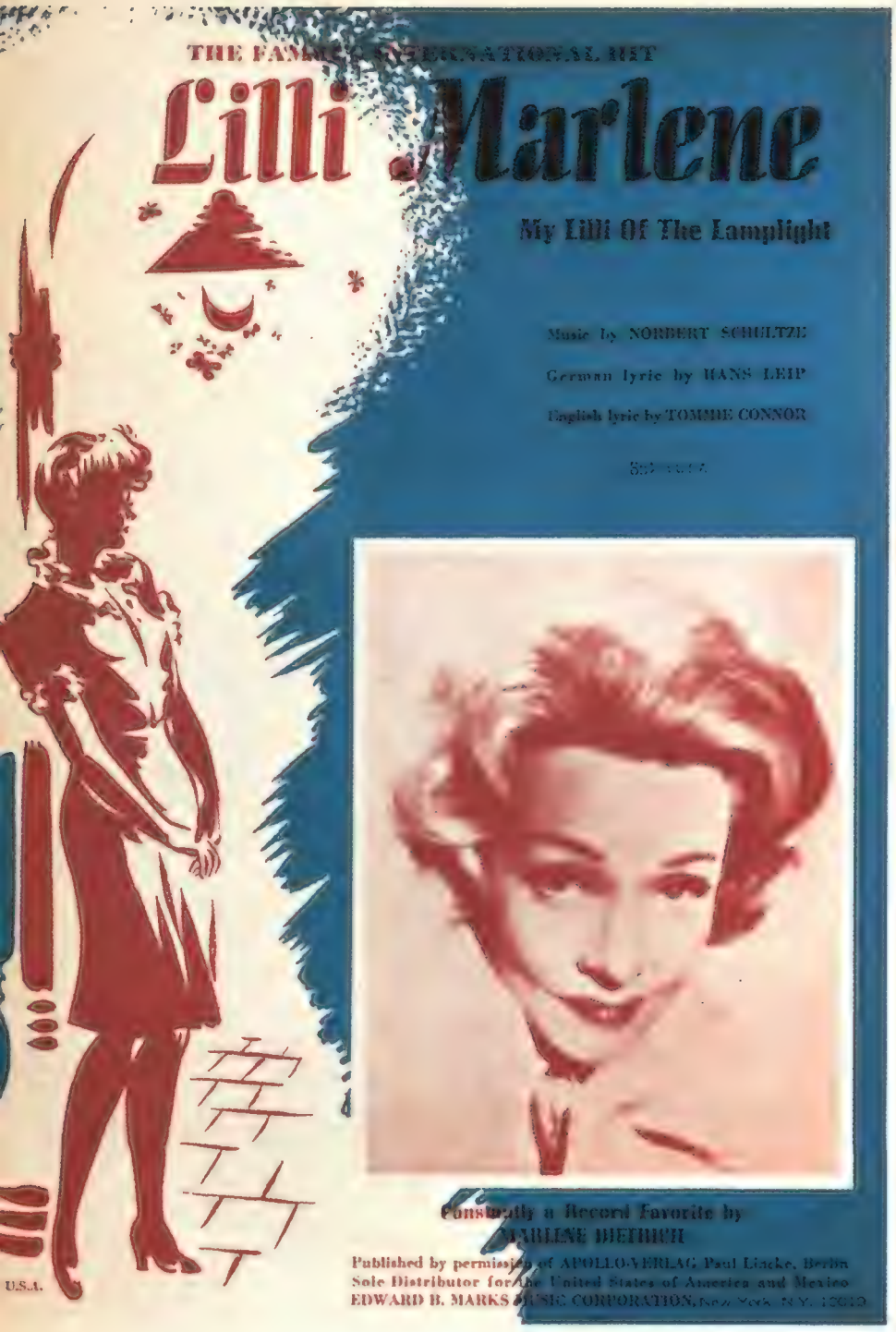
Stand to your glasses steady,
'Tis all we've left to prize,
Here's to the dead already,
Hurrah for the next man who dies!

Obviously, death was nothing to give for what they *believed* in. Damn the mud; the soldier must *believe*.

The short-lived Spanish-American War gave full cry to *Break the News to Mother*. This heartwrencher—seemingly sufficient to end all wars for all time, was composed in 1897 by Charles K. Harris of *After the Ball* fame while he was reclining in a barber's chair. It told originally of a young fireman, but was revised into a soldier song. The song sighed off into the conflict in Cuba.

But foremost was *There'll Be A Hot Time In The Old Town Tonight*. The bouncing tune and lively lyrics were enough to make an excited civilian swell in jubilation. It purportedly was blared while Teddy Roosevelt's Rough Riders whooped up San Juan Hill, and it later became T.R.'s campaign song—to his eventual aggravation. Its composers didn't write it as a war song. But American soldiers sang it so often in Cuba that their Spanish enemies believed that it was our national anthem.

Far off in the Philippines, American troops struggled with an insurrection and expressed their disgust in *The Soldiers' Song*, sung to the tune of the Civil


Lilli Marlene
My Lilli Of The Lamplight
Music by NORBERT SCHULTZE
German lyric by HANS LEIP
English lyric by TOMMIE CONNOR
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Sole Distributor for the United States of America and Mexico
EDWARD B. MARKS MUSIC CORPORATION

War's *Tramp, Tramp, Tramp, the Boys Are Marching:*

> Damn, damn, damn the Insurrectos!
> Cross-eyed *kakiack* ladrones!
> Underneath the starry flag, civilize 'em with a Krag,
> And return us to our own beloved homes.

In 1916—a melodic time when families gathered about pianos and sang songs with good tunes and sensible, if sentimental, words—the National Guard was sent to the Rio Grande to repel bandit raids by Pancho Villa and others. With them went *Lulu:*

> Oh, I wish I was the diamond
> Upon my Lulu's hand
> So every time she [took a bath]
> I'd see the promised land.
>
> Oh, she is a lulu,
> Every inch a lulu,
> Lulu, that pretty girl of mine.

The Great War in Europe was a crusade to the young Americans who flocked to it. Their songs reflected a mingling of gravity and gaiety in the unquenchable American spirit. They sang *Over There* and picked up many of the best British songs—*Keep the Home Fires Burning, Pack Up Your Troubles* and *Tipperary,* a "sleeper," ignored for two years until British soldiers found it great for parodies:

> That's the wrong way to tickle Marie,
> That's the wrong way to kiss;
> Don't you know that over here, lad,
> They like it best like this?
> Hooray pour la France!
> Farewell Angleterre!
> We didn't know the way to tickle Marie,
> But we've learned how over here!

World War II produced few songs worth remembering except *Lilli Marlene,* a German favorite, "liberated" by the British and picked up by the Americans. A story, possibly apocryphal, tells that Hitler wanted the song hushed because it made his troops homesick. The words have little to do with soldiering, but neither do those of the famous Australian soldier song, *Waltzing Matilda.*

After Pearl Harbor, Americans listened to, but never sang *Praise the Lord and Pass the Ammunition,* which might have been a clue that nothing would come later. In training camps they marched to *Don't Sit Under the Apple Tree, Roll Out the Barrel* and a British song, *I've Got Sixpence.* The 3rd Division had a favorite which praised *The Dogface Soldier:*

> I wouldn't give a bean to be a fancy
> pants Marine;
> I'd rather be a Dogface Soldier like I am.
> I wouldn't trade my old O D's for all the
> Navy's dungarees
> for I'm the walking pride of Uncle Sam.*

In faraway places like New Guinea, Army Air Forces people sang. They had no women, no bars, no towns, only movies about Andy Hardy which were shown in the rain. The flyers also had a whiskey ration —a bottle of Pennsylvania rye per four-man tent every ten days. That doesn't sound like much, but every squadron had enough downy-cheeked teetotalers from the Bible Belt so that the dissolute element could keep sufficiently supplied.

So the squadron would set up a party—a "balloon"—and even the Bible-Belt boys would join in roaring out such songs as *Hardships* which was aimed at those comrades-in-arms who were on detached service on *per diem* pay down on the mainland of Australia:

> I wish I was in old Brisbane
> To hear those P.D. boys complain:
> It's hardships, you bastards,
> You don't know what hardships are;
> Six bucks a day plus regular pay
> And the Nips two thousand miles away
> It's hardships, you bastards,
> You don't know what hardships are!

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As the evening wore on the men would harmonize, giving each other self-congratulatory looks when they struck a lingering seventh in such favorites as *When This Bleeding War is Over.* This British song was put to a hymn tune. Another, *I Don't Want to be a Soldier,* expressed the age-old disgust at military life. It got pretty vulgar. But it wasn't as raw as most of the British songs. They came later in the night when the whiskey was gone and the flight surgeon had brought out hospital alcohol and Red Cross fruit drops to dissolve in it.

During every conflict through World War II, soldiers bellyached about mud, food, generals, anything. But mainly they believed in The Cause. Dissenters kept quiet, for the most part, through the Korean conflict. Today, what appears to be a rebellion against war as a political ethic erupts. Songs of protest reflect the open defiance of our Vietnam involvement. From mass meetings and street marches comes:

> How many times must the cannonballs fly
> Before they're forever banned?
> The answer, my friend, is blowin' in the wind,
> The answer is blowin' in the wind.*

Composer Phil Ochs of folk-song fame rendered his own work, *I Declare the War Is Over,* on the Pentagon steps at a tumultuous demonstration on October 21, 1967. *I Ain't Marchin' Any More* came in 1964:

> Call it "Peace" or call it "Treason"
> Call it "Love" or call it "Reason"
> But I ain't marchin' any more.†

Few pro-Vietnam songs exist, and their sound is dim. One took on, in 1963: *The Ballad of the Green Berets.* And more recently *The Battle Hymn of Lt. Calley* record gained a million-and-a-half buyers. But nothing is notable about soldier singing in "Nam." Perhaps transistor radios and USO shows have removed the need for self-entertainment.

An Army enlisted man, a Navy lieutenant commander and an Air Force master sergeant all agreed that the rotation system eliminates the tensions about how long a man must put his life on the line. This reduces the yearnings for home. Yet many Civil War soldiers—robust singers, all—enlisted for 90 days.

Inescapably it seems that soldiers usually sing because of a frame of mind, a spirit that emerges from a deeply believed-in Cause. Vietnam has produced no stirring music, partly because of weariness and disillusionment (see picture below). During last May's war protest in Washington, militant demonstrators, crammed into makeshift jails, bellowed their songs of defiance and sometimes simply of college-days nostalgia; the troops patrolling the city did not sing.

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By Anne Angus

For English kids science is fun

The system of informal classrooms, now investigated by American educators, got a start in Great Britain's 'new science'

Oppressive, grim and joyless were the stark words Charles E. Silberman used in the 1970 Carnegie Corporation report to describe the majority of American elementary classrooms. The model Silberman held out was the informal British approach. To be sure, variants of the British system, and home-grown American versions, have existed here for years. Yet, it is to England that American educators are now looking. SMITHSONIAN *asked Anne Angus, an American who is teaching the new science in a London infant school, for a teacher's-eye report.*

Alastair looked at the batteries, wires and bulbs on the classroom table. "How do you get the electricity out of the battery?" he asked.

"Let's see if we can find out," said the teacher. "Here are some bulbs and bulb holders to screw them into, some clips to attach to the wires and something to fasten the batteries to."

The children examined the bits and pieces, noticing that the wires had metal insides and plastic covering.

Francis: You put the batteries together like this. I've seen them in a torch.

Alexandra: We could tape the wires to the ends of the batteries with cellotape.

They tried this and put the other end on the bulb holder but nothing happened.

About 20 minutes later, after occasional questions to the teacher or suggestions by her, this group of five six-year-olds had found out that electricity must go in a circuit, that if the circuit is broken at any point the light goes out, and they were on their way to inventing a means of switching their bulb on and off with a paper clip.

Meanwhile in another classroom, a group of three five-year-olds were building a dam in a piece of plastic gutter. At the lower end of the propped-up river was a tray of sand. The children had selected various materials for the dam.

"The stones don't make it stop."

"We need something bigger."

"No, it goes through the holes."

"Let's try some sand."

"It's stopped now. Oh, no, it's coming through."

The work these children were doing in a London infant school (a state school for children aged five to seven) is the direct result of the Nuffield Junior Science Project started seven years ago, but it is part of an educational trend traceable as far back as John Dewey's work in the United States, and more recently to the work of a Swiss psychologist named Jean Piaget. The new science is, in effect, active exploration of materials and objects of many kinds.

The discoveries of Piaget and his many followers indicate that a child's mental development goes through definite stages, that stages two and three cannot take place effectively without stage one having been completed. The children playing with water, sand and pebbles were gaining a direct experience of their environment which is a necessary preliminary to understanding the concepts of science—or any other form of learning. Soon they will be ready to understand concepts like "water finds its own level" or other ideas of force and energy, moving and stopping. Their senses, the theory holds, build the foundations for understanding, and a lack of experience and exploration can retard understanding, perhaps indefinitely.

Classrooms are learning shops

Infant science is part of a wider change in the education of young children in Britain. Many modern classrooms have been turned from teaching places into learning shops where all kinds of learning situations are presented in the various corners of the room, rearranged ad lib by the class teacher from time to time. Children know that each day they must do a certain amount of reading, writing, math and other activities. They select their own activities within certain limits and they move, under the guidance of the teacher, from one project to another. The atmosphere is informal, but the teacher must organize the activities to see that each child progresses in each subject.

The children with the homemade dam used the words wider, overflow, deposit, filter, and so forth

over and over in their conversation as they worked. Their speaking vocabulary—which teachers know is a prerequisite to a reading vocabulary—was increasing in leaps as they solved their hydraulic problems.

It is important when teachers are working this way that science does not become a separate subject. Once when the children became interested in lights and color, they went on to make esthetically pleasing mobiles with colored cellophane, foil and one or two suspended light bulbs. Some writing is done, some drawing. Even music is sometimes used to express things learned in a science lesson. Nobody cares whether this is called science or art. It is learning.

There are drawbacks, of course. The number-one difficulty of the new science has been that class teachers of young children may have neither the time nor the knowledge to put the theories of new science into practice. In a class of 40 or more five-year-olds there just is not enough space or teacher time for large-scale explorations and experiment.

Since nearly all state primary schools in England have very large classes—up to 45 or even 50 pupils—the ideal use of the Nuffield method in science is extremely rare. The teacher must cope with the situation in her own way. In spite of the problems, however, Nuffield science and its variations have spread rapidly through the British school system.

An outlet for their curiosity

One thing is well accepted: The method works well for children who have been disadvantaged culturally—that is, those whose vocabularies are weak and who have early failures in school. In the new primary science they find an outlet for their curiosity and energy and are demonstrably helped to learn to read, write and think mathematically. One Liverpool teacher says, "It has opened doors to the less able children which would have been shut otherwise."

Its success with the average or brighter child is more difficult to measure but is evidenced by the fact that every teacher who takes the trouble to really learn the method and give it a good try sticks with it. Its advantages over similar American methods are thought (by observers on both sides) to be its complete flexibility. English teachers do not care much for "kits" and elaborate programs; they let the children lead the way.

More structured schemes may develop, but the majority feeling is that five- to seven-year-olds must be allowed to explore their environment at their own pace and in their own way.

Much as we give a "lesson" in soil studies by simply digging up a nice big sod of earth and letting the children examine it, we must do the intellectual spadework and let them do the learning.

Children test a hammer's conductivity and build circuits in a London infant school (above). Below, a teacher encourages a scientific debate as a child learns mechanics from a bicycle wheel.

Book reviews

The Cruel Choice: A New Concept in the Theory of Development
Denis Goulet
(Atheneum, $12.50)

Denis Goulet comes galloping over the horizon like some questing knight of old, tilting and flailing out at the conventions, myths and sacred cows most of us associate with international development and aid. Writing within the context of relations between rich nations and poor, Goulet challenges us to move our lives in new, more human, directions.

"The aim of this work," states Goulet in his preface, "is to thrust debates over economic and social development into the arena of ethical values. . . . The premise underlying this work is that, for developed and underdeveloped societies alike, basic questions are neither economic, political, nor technological but moral."

Goulet has labored as a factory hand in France and Spain, lived with Bedouin tribes in the Sahara and primitive Indians in the Amazon region. He has served on development planning teams in Lebanon and Brazil and taught at several universities.

In his attempt to reunite ethics and economics, Goulet examines some of the teleological (a favorite word of his) questions increasingly posed by development economics. Much of what goes by the name of development is antidevelopment, he argues. "What then constitutes authentic development? And how can world resources be used to meet the priority needs of all men?"

Goulet describes development as "the sharp forward edge of change which impinges on poor societies to produce the shock of underdevelopment." Among rich nations it tends to have a connotation of "becoming more like us" with which Goulet takes sharp issue.

Goulet's concept of a "human" form of development, described at length in his book, is threefold. First, a development policy ought to aim at abolishing misery, not at obtaining affluence. Second, large-scale austerity must be practiced in advanced countries as well as in developing ones. Third, cultural diversity needs to be actively pursued as a counterweight to today's powerful forces of standardization inherent in modernization processes.

Goulet examines with refreshing candor still other aspects of development:

- Intangible "costs" such as the frustration of persons educated beyond the capacity of a narrow labor market;
- The correlation between a society's internal health and its relationship to environment. It is just as irresponsible to launch societies on irreversible paths in the name of development as it was a century ago to destroy forests, animal species and farmlands on the assumption that resources were inexhaustible;
- The stereotype that citizens of one country are always on the "giving" end and others on the "receiving" end of technical expertise.

Goulet comes up with such solutions as the formation of a world pool of technicians and advisers, competent, sensitive, dedicated "developers" committed to the development of all men.

In *The Cruel Choice,* he looks beyond the day-to-day dilemmas to the logical consequences of the present development policies for both powerful and powerless nations. Whatever the choices we make, he is saying, the going will be tough and harsh. We should opt for eventual survival, rather than eventual demise.
—Henry Pelham Burn

Stalking the Good Life
Euell Gibbons
(David McKay, $5.95)

Who is Euell Gibbons? "He's the prehistoric cat who thinks all this crazy wild stuff is the main scene."

Author of *Stalking the Wild Asparagus, Stalking the Blue-Eyed Scallop* and *Stalking the Healthful Herbs,* he overheard this description of himself when he taught wilderness survival to a group of boys on a Maine Island.

Stalking the Good Life is Gibbons at his best—even though it is Gibbons the second time around. Most of it has appeared in his magazine columns. One essay deals with ways of eliminating can and bottle litter through recycling.

Gibbons thinks all bottlers should use identical, returnable bottles, although labels and caps could vary for individual companies. A deposit of ten cents per bottle would be required at purchase with empties universally returnable for the dime. "Then," says Gibbons, "if some heavy-pocketed slob threw a bottle by the roadside, some kid or some wino seeking enough for another drink would pick it up and return it. These bottles would be as good as sterling in any store."

Gibbons urges that sewage treatment plants remove solids, kill germs and turn the rich effluent into fertilizer. Or the liquid sewage could be piped to man-made land scars—strip mines, for example. He reasons that trees would quickly grow in this organic matter and thus rejuvenate wastelands.

With such way-out ideas, Gibbons finds rapport with young people. A guest speaker at Earth Day rallies, he discovered that they, "dressed in the very height of fashion—that is their sneakers exactly matched their sweatshirts," are concerned and intelligent. He calls upon them (his book is dedicated to a teen-age ecology class) to work on creative ideas for solving our pollution problems. It will take "human ingenuity, applied with love," says Gibbons.

The essays in *Stalking the Good Life* range from foraging for food in the wilderness to the love life of the earthworm. "Worms are wonderful," Gibbons claims.

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Without them the soil would very soon be exhausted.

Gibbons is a climber of trees. When the fruit is ripe, he abandons all caution to explore the upper branches of a persimmon tree. He carries plastic bags to the treetops (as he does on walks) to stuff his goodies in. But he is only 59. "In another 20 years," he says, "I will have to begin easing off on this tree-climbing habit."
—Lillian Moore

Peyote
Alice Marriott and Carol K. Rachlin
(Crowell, $6.95)

The rise of the North American peyote church, the authors of this short book relate, involved a tangle of white and Indian influences. The cult was introduced in this country at the turn of the century by a half-breed Comanche named Quanah Parker, who learned about peyote while being raised by white relatives in Texas. He became ill, it seems, from sleeping in a bedroom and eating settlers' food. This was no casual illness, since his mother and sister had died from similar causes when they were transplanted to white society.

In desperation, Parker's family had him treated by a *curandera,* one of the local Mexican-Indian women reputed to specialize in miraculous cures. The *curandera* was in fact a specialist in peyote, and as soon as young Parker recovered he returned to the Comanches in Oklahoma with a new religion.

The religion spread fast, in part because Parker also imported from his white relatives an impressive knowledge of cattle raising. The advocates of other cults were no match for Parker at economic success. He wound up with a big ranch, eight wives and a mansion containing a bedroom for each wife. Meanwhile he held peyote ceremonies once a week and refused to sleep in the mansion. He slept outdoors where it was healthy.

As for organizing the religion in a formal sense, the Indians were wholly nonchalant until an ethnographer from the Smithsonian Institution convinced them to obtain a charter for the Native American Church. Much of the proselytizing, Marriott and Rachlin report, is carried on in the government boarding schools to which Indian children are sent. In these schools Christian sects are preached in rotation, to display religious tolerance. The Indian children find it natural to inform each other about peyote, describing it as yet another type of religion. Indeed, the Bible is sometimes used in peyote ceremonies.

The peyote church has been attacked as well as aided by white society. In past years the church was attacked by prohibitionists, who confounded peyote with alcohol. At the moment the uproar in white culture over psychedelic drugs threatens to drive the church underground.

The organization of the peyote church and its ceremonies is by no means the whole story. Church membership is untabulated, the ceremonies unprescribed. In Oklahoma, for example, the bylaws have been missing for years, without disturbing the congregation. In business meetings, the authors say, "one Kiowa-Apache has produced . . . a document he insists is the bylaws, but . . . he refuses to let anyone else see it except across the room, let alone handle it. . . ."

Marriott and Rachlin, however, do not probe deep. For readers who want to know more, there are Weston La Barre's *The Peyote Cult* and J. S. Slotkin's *The Peyote Religion.* There is also Carlos Castenada's *The Teachings of Don Juan,* a firsthand account of a Mexican Indian *curandero.* But Marriott and Rachlin's book should make a good introduction.
—Larry Massett

Oceans, Poles and Airmen
Richard Montague
(Random House, $6.95)

They were gathered at the old Curtiss and Roosevelt fields on Long Island, the pilots and their crews, their backers, their designers, their women. They tuned their aircraft engines and issued statements to the press and waited for the weather to clear, out over the North Atlantic.

This was the scene in 1927 as the world's best flyers competed for the $25,000 offered by hotel-owner Raymond Orteig for the first nonstop flight between New York and Paris. Richard Montague, veteran newsman and lately a writer for the U.S. Information Agency, has captured the romance in this sprightly book.

It's a compilation of the old news stories, woven into a more-or-less cohesive narrative. What it lacks in organization it gains in rich detail and the perspective of some 40 years. We glimpse the French war ace, René Fonck. We mourn his countrymen, Charles Nungesser and François Coli, who vanished in their biplane, *White Bird.* We renew acquaintance with that superb pilot, Clarence Chamberlin, the indomitable Norwegian, Bernt Balchen, and the lone airmail pilot (a perfect hero figure even before he became a hero), Charles Lindbergh.

Above all, we get to know at last that handsome and romantic explorer of Polar regions, Richard E. Byrd, bemedaled by Presidents, sponsored by impeccable associations and adored by all the best people.

Alas, to know him is to discover the clay. One of Mr. Montague's primary purposes in writing this book was, in his words, "to expose a fraud that has persisted for nearly half a century."

It would be unfair to reveal the plot. But I cannot help recalling my boyhood thrill at watching a seaplane land on Boston's Charles River and a young man climb from the cockpit and row ashore in a rubber raft. Proper Bostonians, lining the Esplanade,applauded decorously. Here was Commander Byrd, Apollo in a leather jacket, back from one of his adventures. Montague shatters another illusion for me.
—Edwards Park

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Smithsonian highlights

Division of Performing Arts
The fifth annual "Festival of American Folklife," on the Mall from July 1 through 5, features musical performances and demonstrations by craftsmen from Ohio and Northwest coast Indians and Eskimos. It will also focus on American organized labor, with demonstrations by a wide range of journeymen and panel discussions on the labor movement.

"The Waywardly Wandering Wagonful of Banjo and Jack," created by the Allan Stevens company, is featured at the Smithsonian puppet theater. The show includes 19th-century folk songs and stories. Daily, Wednesday through Sunday, with a special performance July 5—Museum of History and Technology.

Museum of History and Technology
(This building will be open from 10 A.M. until 9 P.M. daily through Labor Day.)

"American Heroes" is a slide show projected 40-feet high on the Constitution Avenue side of the building, including 18 slides of such American heroes as Washington, Jefferson, Lincoln, the Roosevelts, Martin Luther King and Chief Joseph, daily at 9 P.M.

"Microfilm" commemorates the centennial of micro-image technology, exhibiting equipment, film and blowups, and illustrating the evolution of microfilm from creation to future applications.

"The Black Ships" is a Charles Eames film showing artifacts of the journeys of Commodore Perry, including the opening of Japan.

"Slovenes in America: An Instance of Cultural Impact" includes artifacts and photographs reflecting the religion, society and home life of Slovenes and their influence on the American way of life. Opens July 16.

"Soup Tureens," collected by the Campbell Soup Company, make up this exhibition which includes many porcelain and silver antiques.

"Music Machines—American Style" features the music-making machines that have revolutionized the performance, reproduction and dissemination of music in this country. The exhibit has live performances, lectures, recordings and movies shown continuously.

Museum of Natural History
"Insect Zoo" is an exhibit of live insects including a beehive, termites, many varieties of cockroaches, mosquitoes and dragonfly nymphs. It also includes tarantulas and spiders weaving webs.

"Animal Artists" features about 40 works of art by well-known painters belonging to the Society of Animal Artists.

National Collection of Fine Arts
"Children's Gallery," entered through a hole in a door, is a permament new gallery including floating Mylar balloons, "be-alive" mirrors, sensory-stimulating sculpture and "discover boxes" set at three-year-olds' viewing level.

"Hidden Aspects" is an exhibition of diverse treasures belonging to the National Collection but not usually on view (see article on page 16).

"American Master Prints" is a survey of three centuries of graphic art in America from the Smithsonian collections. Opens July 7.

"Romare Bearden: The Prevalence of Ritual" presents 56 works including many collages by this contemporary black artist. Opens July 16.

National Portrait Gallery
"'A Glimmer of Their Own Beauty': Black Sounds of the Twenties" focuses on blues, jazz and poetry with a period jukebox, films and readings reflecting black life in the Twenties.

Anacostia Neighborhood Museum
"Man's Greatest Adventure" is an exhibit illustrating the contributions of the black man to science in America. Opens July 18.

Freer Gallery of Art
"Chinese Album Leaves and Lacquer Ware" is a collection of 24 painted album leaves dating from the Sung through the Ch'ing dynasty. Also included are five examples of Chinese lacquer ware that represent the change in style from 1280 A.D. through the late 15th century.

"Japanese Screen Paintings" include bird and flower screens from the late 15th century to the 18th century.

Traveling Exhibition Service
Binghamton, New York—"Marsden Hartley" (Roberson Center for the Arts & Sciences, July 3-August 1).
Williamsburg, Virginia—"Folk Toys from Japan" (Abby Aldrich Rockefeller Folk Art Center, June 26-August 22).
San Diego, California—"From Knowledge, Sea Power" (San Diego Historical Society, July 3-August 1).
Ypsilanti, Michigan—"The Frederick Douglass Years I" (Eastern Michigan University, July 10-August 8).
Corvallis, Oregon—"Prehistoric Paintings of France and Spain" (Oregon State University, July 17-August 8).
Yonkers, New York—"The Hand of Man on America" (Hudson River Museum, July 3-August 1).

Arts and Industries Building
Apollo Lunar Module on display is a flight-weight, operational, back-up lunar landing craft. The moon rock, weighing slightly more than a pound is the largest remaining sample from Apollo 11. The Apollo exhibit is expanded to include the Apollo 11 Command Module, flight suits and rock box, and a set of surface tools like those the Apollo astronauts used on the moon.

Smithsonian Commons
Luncheon facilities for staff, resident scholars and all members of the Smithsonian Associates are located in the original Smithsonian Building. Open weekdays from 11:30 A.M. to 2:00 P.M., the Commons offers a buffet luncheon from $1.25 to $1.75 upon presentation of a membership card.

By Patrick Ryan

Grow bald along with me, the best is yet to be

News comes out of India offering possibly 20 million balding American males the comforting knowledge that they do not molt alone. Baldies International has been founded in New Delhi. It's an organization of deserted pates aiming "to inculcate pride in baldness, to disseminate knowledge regarding causation of baldness, and to compile a directory of eminent baldies." Speaking as one whose center parting since time immemorial has been a foot wide, I am personally heartened to learn that similarly endowed Hindus are proposing to walk in the future with their depilous heads held high.

However the Seventies may later appear, these years seem marked by the desperate concern of males to prevent the revelation that their scalps are naked. Never before has there been such a market for wondrous pomades of dubious concoction which, for a ransom price, are guaranteed to raise bristles on passing billiard balls. And rarely before has the futility of such elixirs been more clearly indicated: Unguent peddling has largely given way to the hawking of artificial hair.

Fortunes are being made by selling adhesive male toupees at up to $500 a rug. Wig wearers without faith in gum can seek greater security, at $1,000 and more a time, by having their mops surgically attached to the living scalp by sutures of Teflon-coated wire. Hair weaving, in which the false top dressing is crocheted into the hirsute remnants still flanking the main tonsure, comes cheaper at first but involves upkeep costs of $5 to $50 for relashings every six weeks when the rug comes loose as the anchor hair grows. Those with Frank Sinatra's income and an urge to regress to adolescence, may duplicate his painful, grisly and surpassing-expensive, natural-hair transplant. Plugs of remaining back hair are gouged out and replanted in suitable holes opened in the bed of baldness.

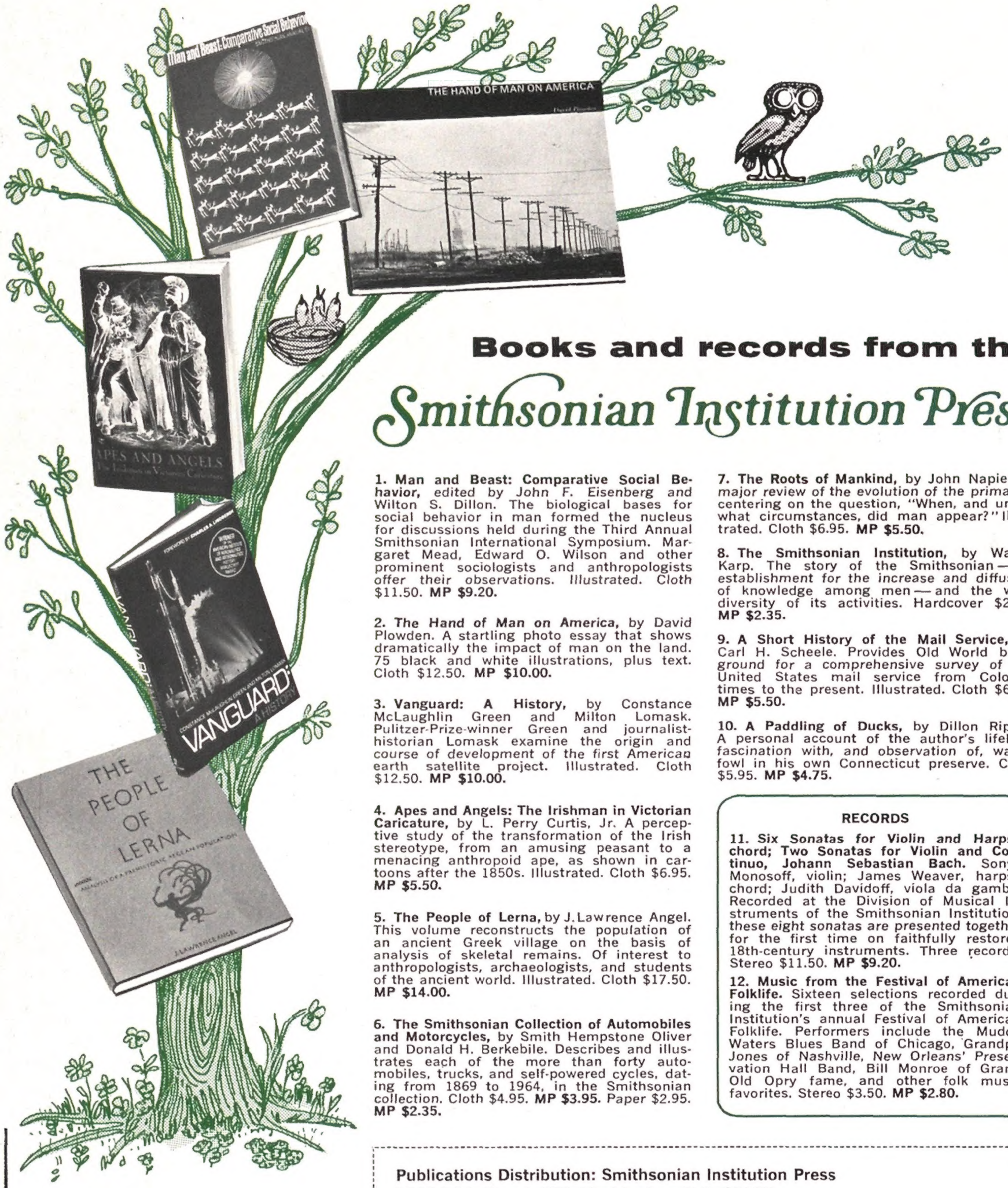
Within the bare but dignified skulls of Baldies International wonderment will be aroused as to why lesser men should be so concerned as to disguise the benison of baldness. That there can be no shame in that cool cranial state is borne out by the general medical opinion that there are two major types of baldness. The commonest is hereditary and, pending the profession learning a lot more about the possible manipulation of sex hormones, is held not to be influenced by any treatment available. The rarer is *alopecia areata* which can be caused by nervous stress and will in most cases get better by itself. Although unaffected by unguents, its self-righting forms the basis of claims for their success.

In the days of my vanity I accepted the assistance of every hair restorer brought to notice by publicity, rumor or old wives' tale. And I did not grow hair. I recommend to the young with extending temples that it is better for the pocket and the nervous system to abandon the fruitless battle and gracefully accept the glory that is baldness for the grandeur that was hair. An externally bare pate has ever been construed as a mark of internal wisdom. The compliment is confirmed today by the use of the terms "highbrow" and "egghead" to denote those with an intellectual bent.

Folklore has long implied that a plethora of male locks may accompany short change in masculinity; and, conversely, that bald scalp can be a token of virility. No bald man, therefore, would consider a jungle of hair adequate recompense for the interest that his naked skull with its hot promise of l'amour arouses in nubile women at a crowded cocktail party.

So, little brothers of the receding hairline, grow bald along with me, the best is yet to be. Relax and join the proud ranks of Julius Caesar, Socrates, Shakespeare and now Baldies International of New Delhi.

I'll join you all in a moment, after I've checked on the latest report that a mechanic in Stevenage, England, who'd been bald for 16 years, has just found his hair returning since he started repairing leaks in the new North Sea natural gas supply system. "The gas," he said, "must contain some substance which encourages hair growth." So I'll just give my ivory top ten minutes inside our natural-gas oven and let you all know if it's the real hirsute McCoy this time or just another case of prolonged *alopecia areata.*



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